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AUGUST 21, 1950
VOLUME 39, No. 17

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

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BETTER SALES
through BETTER WHITES

Since the war the optical bleach has been one of the leading stimulants for textile sales — particularly in cottons and viscose rayons. Mills which had continued old bleaching methods are quickly realizing that the optical bleach —

— gives infinitely better whites on cotton.

— gives purer whites and clearer ground shades on viscose rayon.

The sales counter continues to tell the rest of the story.

TINOPAL BVA

the ranking product *for the mill*, has played a real part in Better Sales through Better Whites.

*Write for a booklet clearly illustrating the effectiveness of Tinopal BVA.**

* *Patent applied for*

Geigy
Dyestuff Makers Since 1859

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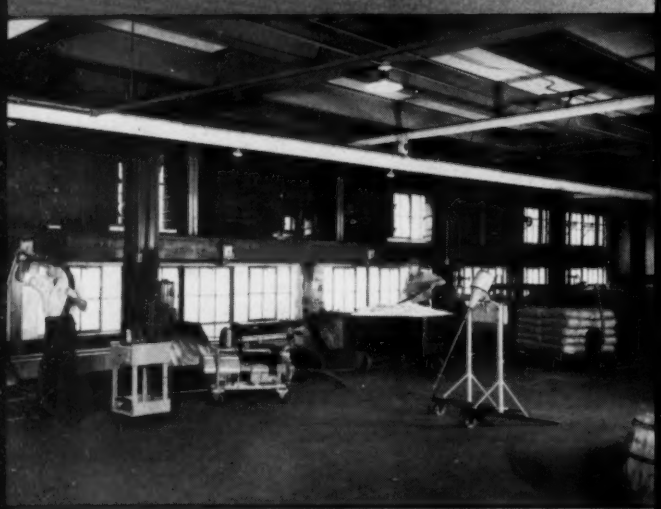
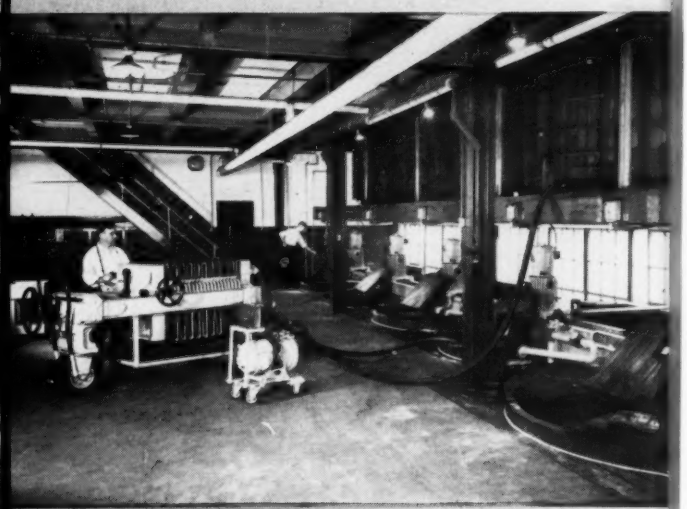
exclusive equipment-
new ideas
to give you a **superior product**

One of the reasons WHY the industry "looks to Althouse" for the newest and best in dyestuffs is because of our more modern methods of manufacture. First of all, we originate "new ideas" . . . then we have exclusive equipment built-to-order for perfect production. For example: our steam dryers are all instrument controlled—we use all Pyrex heat exchangers—electronic recording thermometers—and all special metal fittings, valves and pumps are made of Hasteloy C. These many scientific steps have been taken so that ALTHOUSE DYESTUFFS NEVER COME IN CONTACT WITH ANY CORROSIVE METALS WHILE IN THE WET STAGE. That means we keep *impurities out* of finished dyestuffs . . . to give you a better finished product!





pace-setter in precision dye-making

ALTHOUSE
Chemical Company, Inc.
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Announcement!

ACETATE BLACK DYERS . . .

amazing new developments have been taking place
in the improvement of our **AMACEL* BLACKS.**

Absolutely tops! the **NEW, IMPROVED**

Amacel BLACKS

. . . BLACK G.S.
. . . BLACK IV EXTRA

As developed with Developer BON or BONASOL* these new, improved *Amacels* give the finest **developed blacks** obtainable. Perfected through the latest scientific advancements, they offer to a greater degree than ever, better fastness—simplified application—consistent shade purity. Both are suitable for box or jig . . . both are highly dispersed—**practically water soluble**—holding stain on adjacent white viscose to a minimum.

American Aniline was the first successful U. S. producer of dyes designed especially for acetate fibres, and high quality has kept *Amacels* at the top in this field.

For detailed information on *Amacel Black G.S.* and *Amacel Black IV Extra,* as well as special data regarding your own particular requirements, consult our nearest branch. A.A.P. technicians are always happy to be of service.

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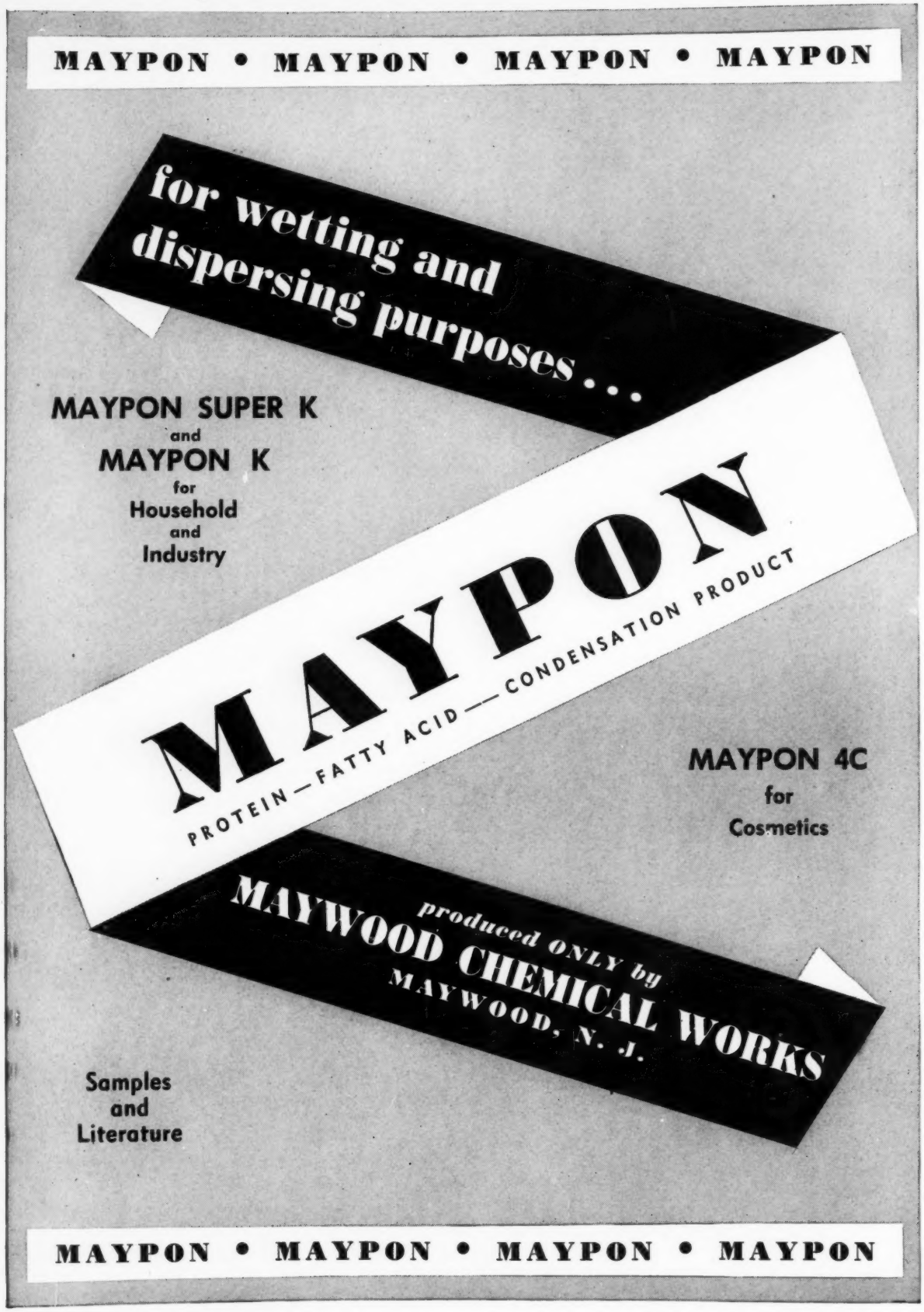

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(100% active)

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(25% active)

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SAMPLES and FULL PARTICULARS AVAILABLE UPON REQUEST

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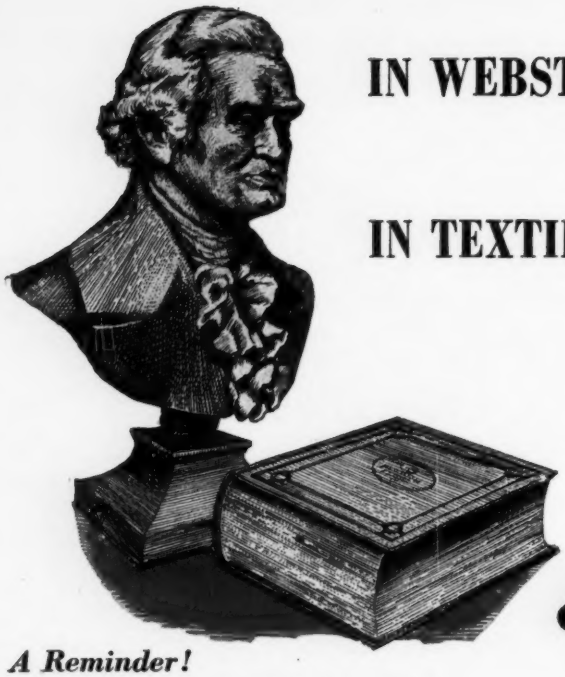

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IN TEXTILES, "Van Vlaanderen" means the leader in dyeing and finishing equipment.

For nearly fifty years Van Vlaanderen has always been a step ahead—in design, in workmanship and in service.

A Reminder!

Whether you need a single machine or an entire plant, Van Vlaanderen engineers are ready to help you.

A partial list of our equipment is shown below

Acetate Boil-off & Setting Equipment • Acetate Tricot Presetting Machines • Agers • Apron Conveyors • Back Riggings • Batching Stands • Back Washers • Beamers • Bleaching Equipment • Boil-off or Degumming Machines • Calendars • Caustic Conveyor Machines • Coating Machines • Continuous Washers • Cottage Steamers • Cotton Back Finishing Machines • Decating Machines • Decating Blankets • Doubling • Tubing Machines • Dye Jigs & Reels • Examining & Measuring Machines • Extractor Loaders • Full Width Machinery • Greige Goods Washers • Greige Goods Winders • Electric Guides • Hydraulic Calendars • Hydraulic Pumps • Initial Wet Treatment Machines • Jigs, All Types • Laminating Machines • Measuring Machines • Nylon Heat Setting Machines • Padding Machines • Palmer Tenter Units • Resin Impregnators • Rolls, Rubber, Paper, etc. • Roller & Knife Coating Machines • Rolling Up Machines • Rubber Extractors • Scutchers • Second Hand Equipment • Slack Print Washers • Submerged Type Scouring Units • Take up arrangements, constant speed • Tensionless Constant Speed Dye Jigs • Tentering Frames & Clips • Tricot Presetting Machine • Tubing Machine.

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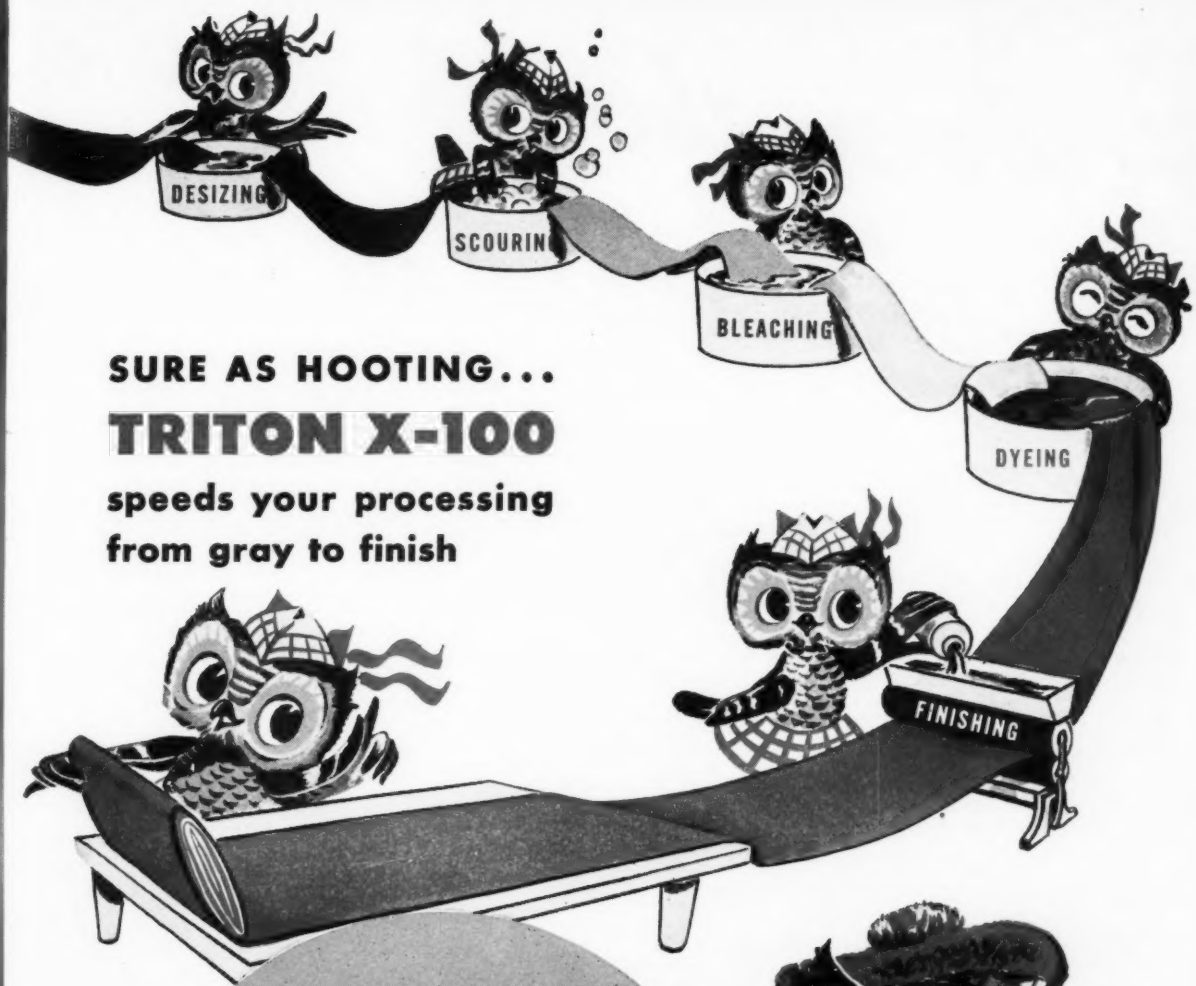
World's largest manufacturer of machines for processing modern fabrics



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TRITON X-100

speeds your processing from gray to finish

Makes water wetter —so it penetrates better

TRITON X-100 is a concentrated 100% active penetrant and detergent, non-ionic, and alkali-and-acid stable. As a scouring agent for wool, cotton and synthetic fibres, it is a fast wetter, an excellent detergent and an outstanding emulsifier for oil and grease. And in dyeing and finishing too, it speeds processing and cuts costs. Be wise and thrifty. Send for full details of TRITON X-100 today.

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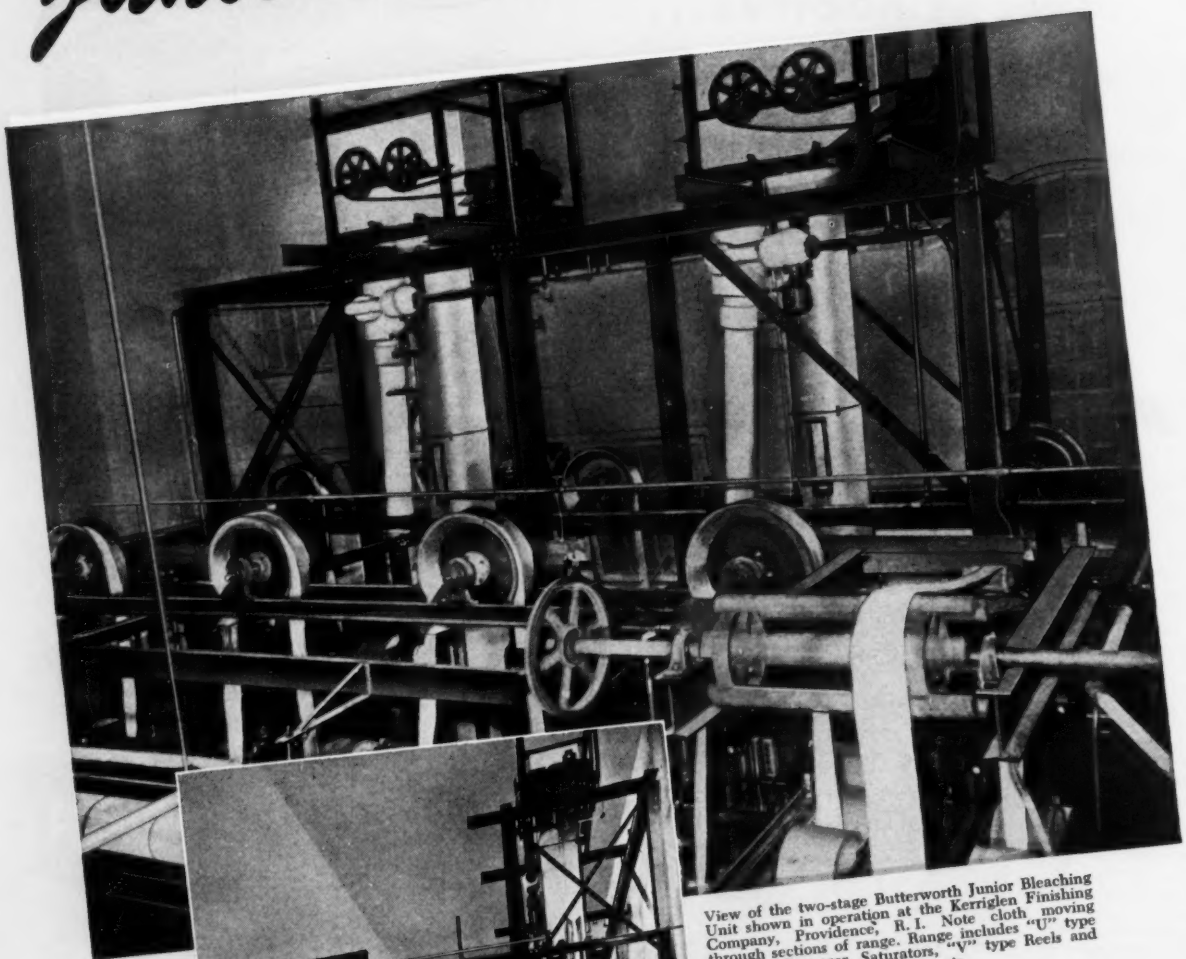
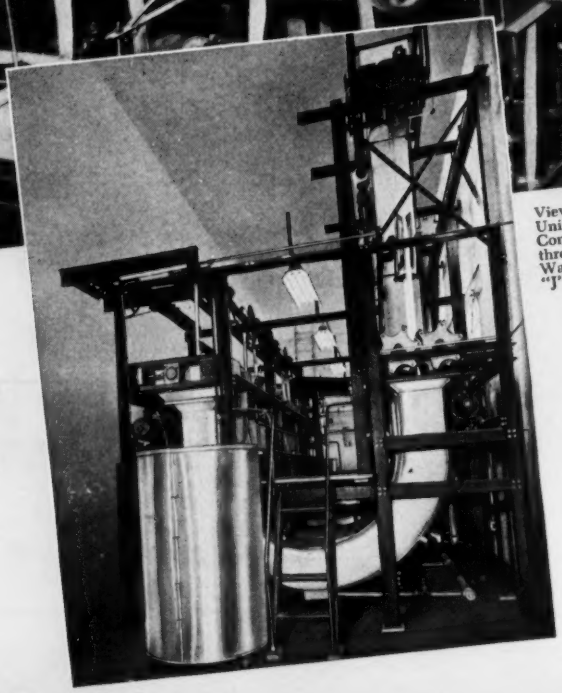
Here's on-the-job proof of Junior Bleaching Unit



View of the two-stage Butterworth Junior Bleaching Unit shown in operation at the Kerriglen Finishing Company, Providence, R. I. Note cloth moving through sections of range. Range includes "U" type Washers, Squeezer, Saturators, "V" type Reels and "J" type Bleaching Compartments.



Compact height of the two-stage Butterworth Junior Bleaching Unit installed at Kerriglen can be seen in this view of the range. Control of range is from center of the Unit on operating floor.

Production!

A two-stage Butterworth Junior Bleaching Unit is now in successful operation at the Kerriglen Finishing Company, Providence, R. I., bleaching 4 yard, 80 x 80 print cloth, at the rate of 700-900 lbs. per hour. Now—actual proof that it's possible to get high quality bleaching continuously and economically with the Junior Bleaching Unit. The Unit installed at the Kerriglen Finishing Company is a *complete* bleaching range developed in conjunction with DuPont for small production bleaching.

You can put a Butterworth Junior Bleaching Unit to work profitably in your mill bleaching knit goods, colored yarns, print goods and other fabrics. It gives the efficient small mill or the large mill doing specialty bleaching the economies of continuous peroxide bleaching. The machine shows some savings in steam consumption, and only one man is required to operate the Unit as compared with two men on conventional ranges.

The two-stage Butterworth Junior Bleaching Unit requires a floor space only 40 x 16 feet. The J-box is approximately 28 feet in height, but this height requirement may be reduced somewhat by placing the bottom of the J-box in a pit below the floor line. Cloth is handled gently and efficiently with patented Butterworth tension control devices. Inspection windows permit easy checking throughout the bleaching operation.

Get the complete details on the Butterworth two-stage Junior Bleaching Unit today. Write for Bulletin No. 200.

H. W. BUTTERWORTH & SONS CO.
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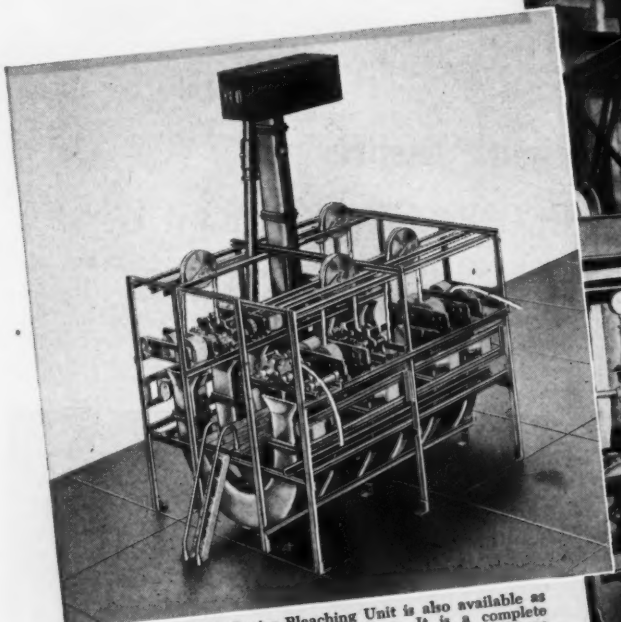
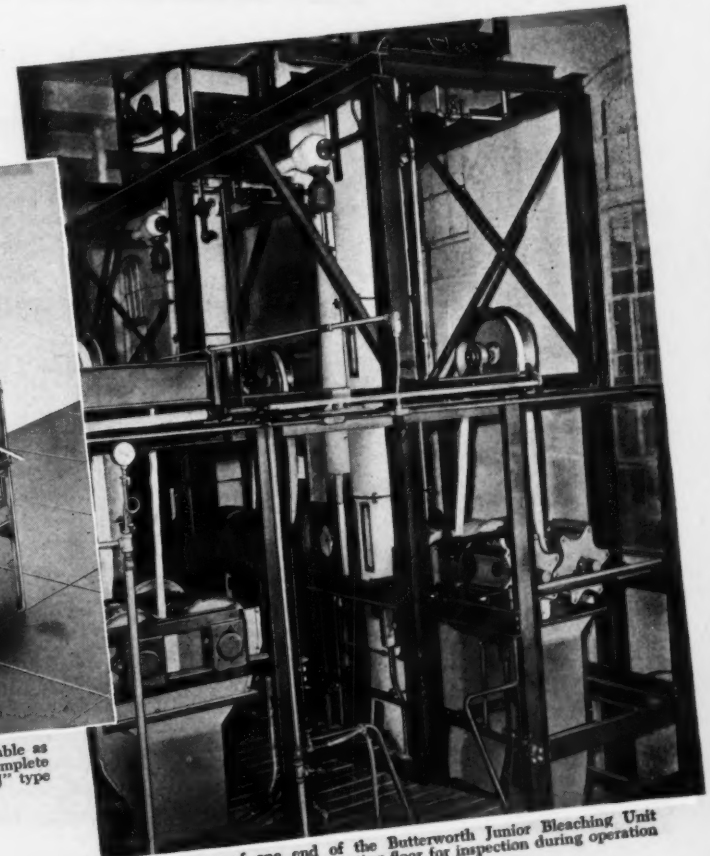
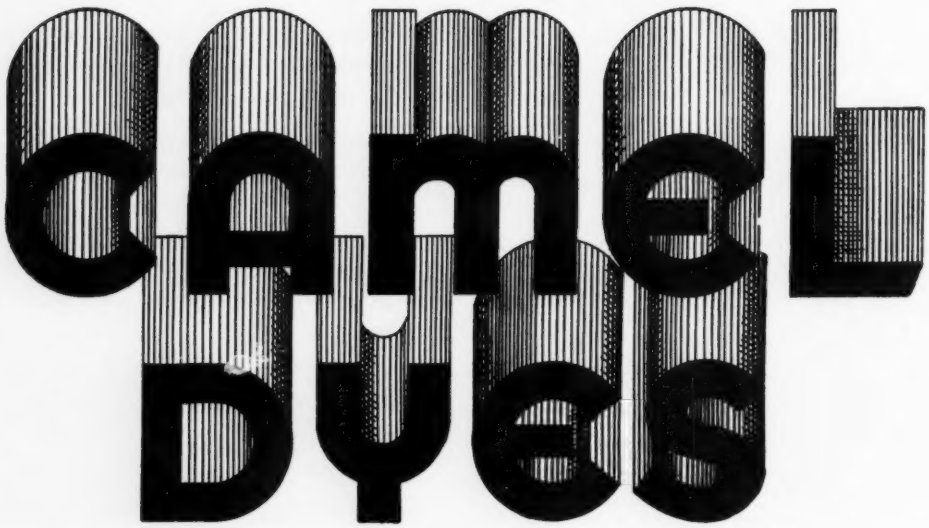


The Butterworth Junior Bleaching Unit is also available as a single stage range as shown above. It is a complete operating Unit with Squeezer, Washers, Saturator, "J" type Bleaching Compartment and Reels.



Close-up of one end of the Butterworth Junior Bleaching Unit shows easy access to operating floor for inspection during operation of range.



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get efficiency in scouring after continuous dyeing with

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The high detergency of Monsanto Santomerse No. 1 is your assurance of *thorough* scouring at the high speed of continuous dyeing. Santomerse No. 1 rinses out completely and quickly, leaving colors clear and bright and leaving cloth with a soft feel that appeals to buyers. Along with its efficiency, Santomerse No. 1 is *economical*. Only 1 to 3 pounds of the detergent are required per hundred gallons of water. In addition to scouring, Santomerse No. 1 may be employed in the oxidizing unit, where it brings about rapid wetting action.

Versatile Santomerse No. 1 is efficient in hard or soft water . . . in hot or cold solutions . . . in acid, neutral or alkaline baths. It guards the quality of textiles by preventing the formation of insoluble soap curds.

If you would like more information on the use of Santomerse No. 1 in connection with your continuous dyeing . . . or about the use of Santomerse No. 1 as a penetrant, dispersant or detergent in other textile operations . . . mail the coupon or contact the nearest Monsanto Sales Office. MONSANTO CHEMICAL COMPANY, Phosphate Division, 1779-H South Second Street, St. Louis 4, Missouri.

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PEAK PERFORMANCE in STRIPPING and DISCHARGING ACETATE, WOOL and NYLON

For all-around efficiency and economy in stripping and discharging acetate, wool and nylon fibres, you can be assured of top performance with HYDROZIN ($ZN(HSO_2.CH_2O)_2$) . . . a clear-dissolving, soluble zinc formaldehyde sulfoxylate.

It is Economical—Because of its stability and strength, only a small percentage is required for best results.

It is Versatile—Effective on a wide range of dyestuffs, HYDROZIN produces a whiter ground and assures better color values.

For top performance in stripping and discharging acetate, wool and nylon, use HYDROZIN.

HYDROSULFITE AWC
($NaHSO_2 \cdot CH_2O \cdot 2H_2O$)

For printing of vat colors and discharge printing of all textile fibres.

HYDROSULFITE OF SODA CONC.
($Na_2S_2O_4$)

For reduction of vat colors in dyeing, stripping, etc., our stabilized, maximum concentrated for strength and purity

You are invited to write for additional information on these products.

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WOLF BRAND CHEMICAL SPECIALTIES

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WHY ALGOSOLS

AN EASY ROAD TO VAT FASTNESS

ALGOSOLS are water soluble esters of vat dyes. They produce the same brilliant shades and have the same fastness properties as the parent vat dyestuffs from which they are derived. On cotton and rayon they are more level dyeing and have better penetration than ordinary vats. Prints are smoother and clearer than normally applied vat dyestuffs. On wool Algosols have superior light and wash fastness without impairment to the quality of the wool. The method of applying Algosols is simple and inexpensive.

COTTON

Mercerized cotton piece goods of constructions otherwise difficult to color, have outstanding smoothness and penetration when dyed with Algosols. The shades of colored yarns used for cross-dyed effects in striped shirtings, etc. are not affected when over-dyed with Algosols. Mercerized and other types of cotton yarn dyed in package dyeing equipment are uniform, evenly colored from outside to center and free from crossovers.

WOOL

Suitings dyed with Algosols have excellent fastness properties even in light shades. Blankets and knitting yarns have outstanding fastness to light and washing. Algosols are recommended for dyeing slubbing and yarns in circulating machines. Shrink-proofed wool dyed with Algosols has excellent fastness to light and repeated washings. Wool can be dyed with Algosols without impairment to the quality of the wool.

RAYON

Rayon piece goods composed of filament, spun rayon or filament-spun rayon yarn when dyed by the continuous method or on the jig have solid, clear shades and excellent fastness. Rayon skeins are easily dyed on the 'Cascade' type machine. Algosols are excellently suited for dyeing packages and cakes in pressure dyeing equipment.

PRINTING

In roller, screen and resist printing prints are smoother and colors clearer than the normally applied vat dyestuffs from which they are derived. Algosols have excellent light and wash fastness and do not crock. Blotch printed drapery fabrics have smooth grounds with excellent fastness to light and washing. Algosols are ideal companion colors for Rapidogens and Fast Color Salts.

MIXED FIBERS

Suitings and dress goods of spun rayon and wool blends dyed in solid shades meet all fastness requirements. Special effects can be obtained on cotton-wool and rayon-wool mixtures by dyeing the wool and leaving the cellulosic fibers undyed or on viscose-acetate blends the viscose can be dyed fast color and the acetate tinted to yield two-tone effects.

COST

The simplicity of application, saving in time, lower cost of chemicals, superior dyeing and printing results offset any increase in dye cost over ordinary vats in light and medium shades. Not infrequently Algosols prove cheaper in light shades.

✓ **DELIVERIES** To insure prompt deliveries stocks are carried in warehouses strategically located throughout the country.

Technical information, product samples and the service of a highly trained technical staff are yours for the asking.

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NOW chemically inert KEL-F* diaphragms for GRINNELL-SAUNDERS DIAPHRAGM VALVES

H_2SO_4 H_2CrO_4 HCL HNO_3 HF

C_6H_5CL Br_2 $SiCL_4$ CH_3COCH_3 CCL_4

*KEL-F is the registered trade name for polytrifluorochloroethylene, an exceptionally stable thermoplastic produced by The M. W. Kellogg Company. Its resistance to chemical action, low cold flow, wide range of temperature application and flexibility combine to make KEL-F the most important diaphragm development in the past ten years. It is chemically inert to all inorganic acids, alkalies and the like with the exception of molten alkaline metals such as sodium. KEL-F is also chemically inert to organic materials but may be plasticized or swelled slightly by halogenated organic materials. However, test installations indicate that this plasticizing or swelling action is of minor consequence and in the majority of cases does not affect valve operation.

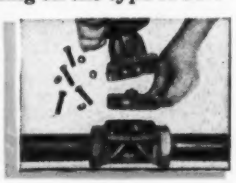
plus all these unique valve features

Diaphragm lifts high for streamlined flow in either direction . . . Smooth, streamlined passage, without pockets, prevents trapping of sludge and reduces frictional resistance to a minimum — irrespective of direction of fluid flow. No disc holder in fluid stream. Grinnell-Saunders Diaphragm Valves are self-draining when installed with the spindle at 15 degrees above the horizontal position.

Diaphragm absolutely isolates working parts from fluid . . . There's no "if" about the way a continuous, one-piece diaphragm seals off the working parts from fluids; no perforation or puncture in the diaphragm where fluid or gas can possibly leak by the valve spindle. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate the fluid in the line.

Diaphragm, body and lining materials to meet particular conditions . . . Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum: other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Diaphragm is only part that normally wears and needs replacement . . . Depending on the type of service, it may last for years, particularly since the compressor and finger plate combine to support the diaphragm in all positions. The diaphragm can be replaced quickly without removing valve from line. No refacing or reseating.



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NOW chemically inert KEL-F* diaphragms

H_2SO_4 H_2CrO_4 HCL HNO_3 HF

C_6H_5CL Br_2 $SiCL_4$ CH_3COCH_3 CCL_4

for GRINNELL-SAUNDERS DIAPHRAGM VALVES

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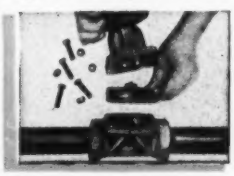

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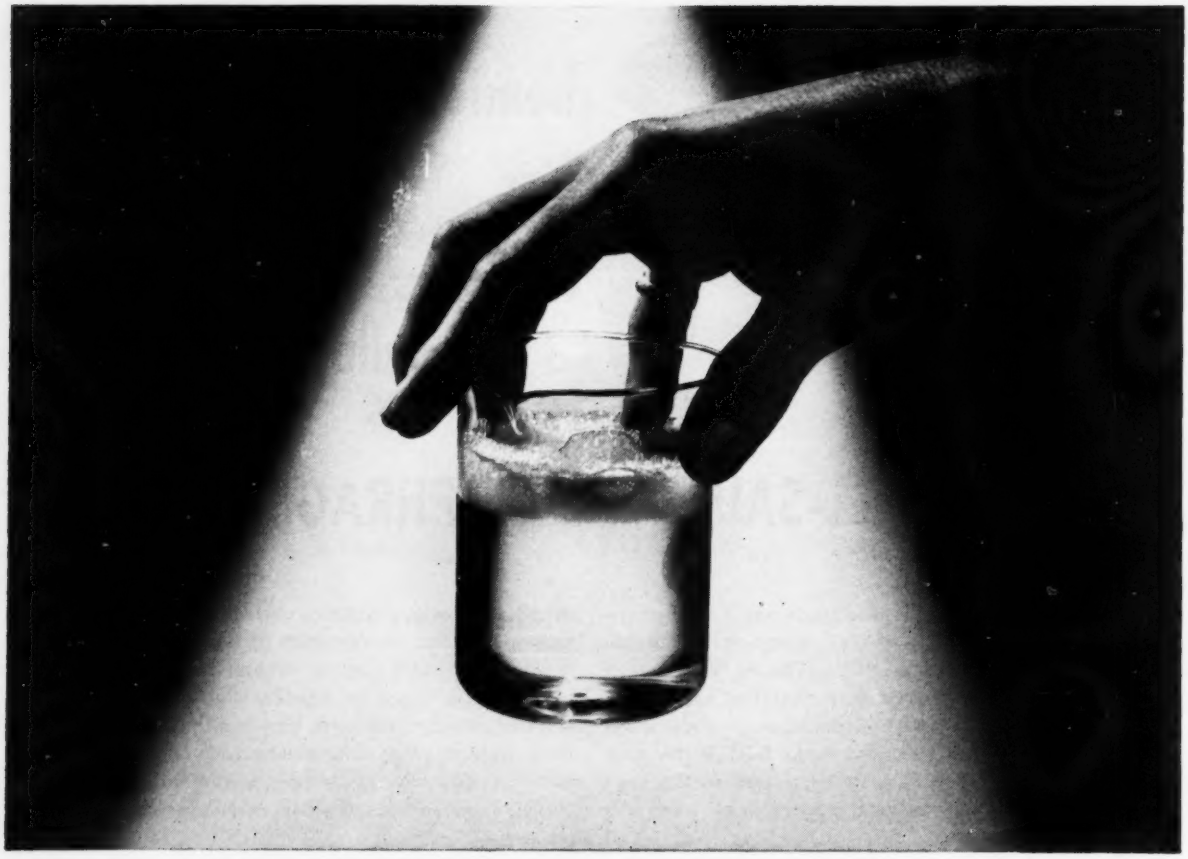

YOU CAN SEE WHY

Wyandotte "high-light" Kreelon leaves no residue*

Textile fibers can absorb appreciable amounts of certain detergents which cannot be removed by ordinary rinsing. Also any insoluble material introduced in the processing bath may remain in the fibers.

This residue affects the handle of the fabric. It may affect subsequent finishing operations, alter colors and produce odors.

That's why it's a good idea to use Wyandotte "high-light" Kreelon. This superior detergent dissolves more quickly, is more soluble than most other detergents, and forms no insoluble water hardness complexes. It makes a clear, water-white solution. These qualities may be strikingly demonstrated by dissolving samples of Kreelon and other detergents in separate beakers of water — and holding them up to the light. Note the clarity of the Kreelon solution. Compare it with the hazy, "muddy" appearance of the other detergent solutions.

Kreelon is strongly recommended for textile scouring, dyeing and bleaching operations. It provides excellent detergent, wetting, penetrating, and rinsing properties in hard and soft water, in alkaline and acid media. Its performance is guaranteed by a three-way detergency test. Write us today for complete data on the properties and applications of Wyandotte "high-light" Kreelon.

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Wyandotte, Michigan ***Offices in Principal Cities***
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SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
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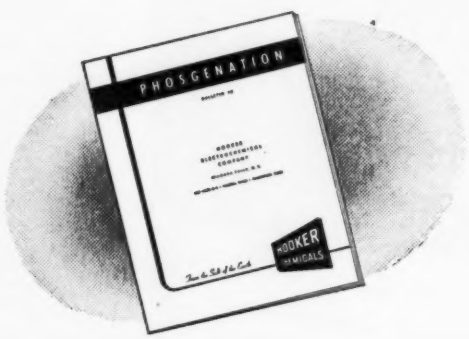
$$R + COCl_2 \longrightarrow RCR + HCl$$

6. **Phenols to Chlorocarbonates or Carbonates**

$$ROH + COCl_2 \longrightarrow ROCCl + ROH \longrightarrow ROCOR$$



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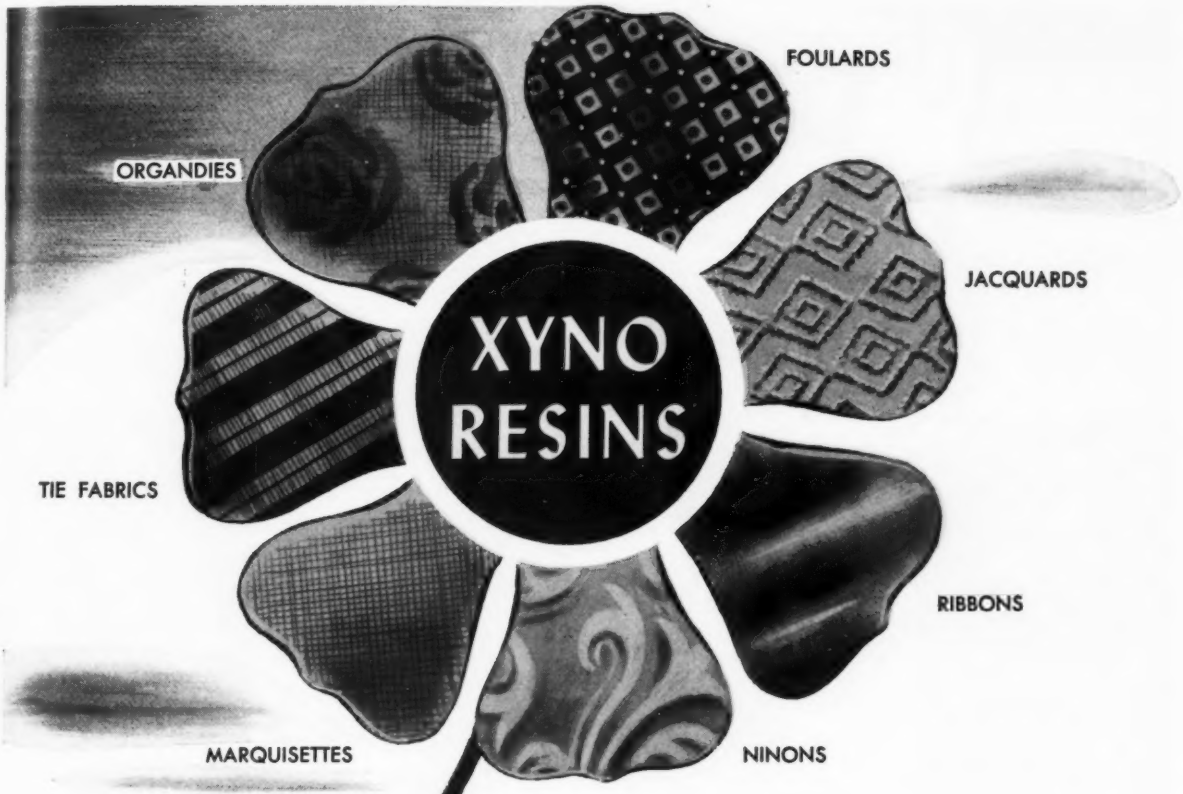

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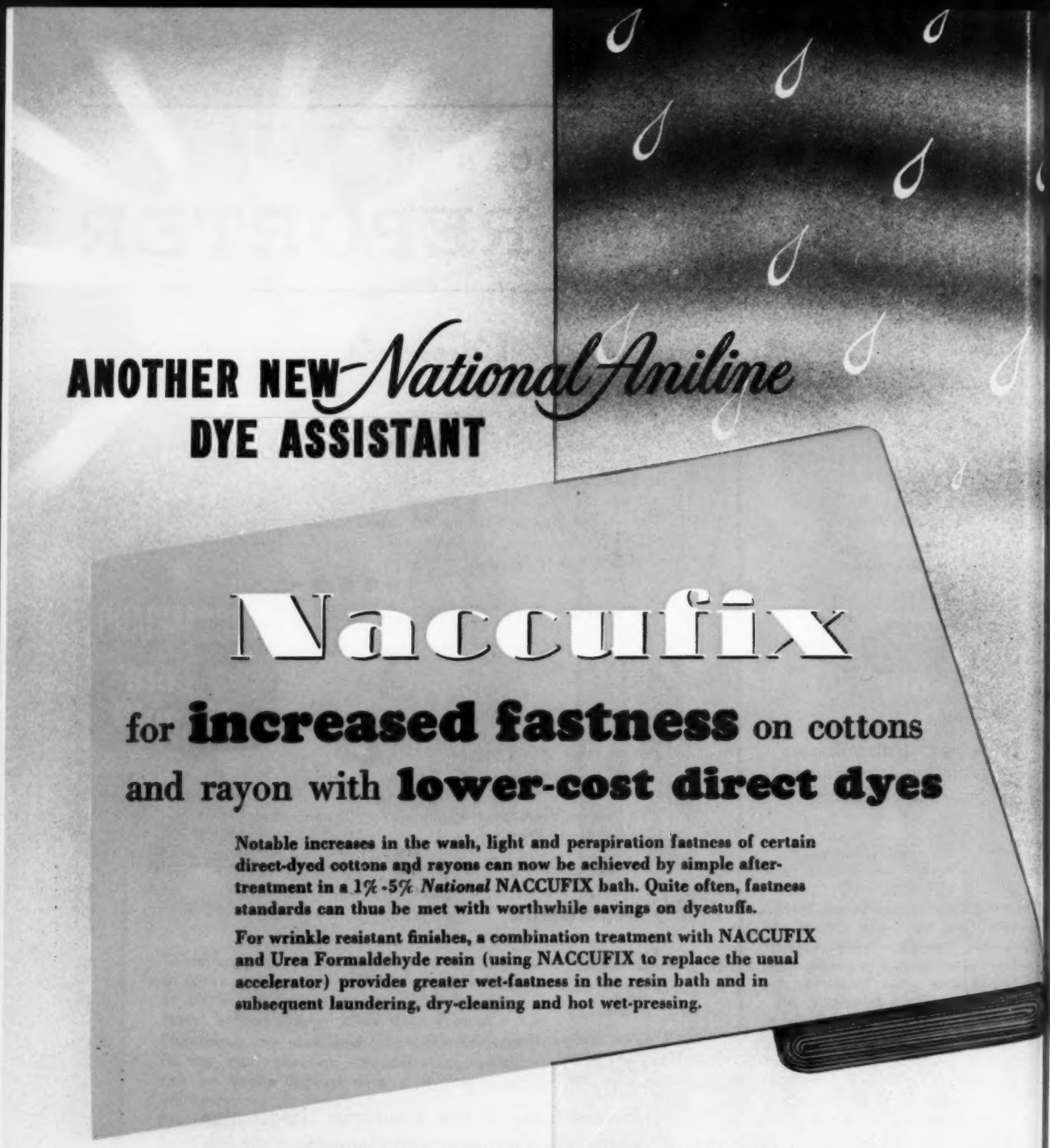

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TABLES FOR USE IN COMPUTING SMALL COLOR DIFFERENCES

DOROTHY NICKERSON
United States Department of Agriculture, Production and Marketing Administration, Washington 25, D. C.

SEVERAL formulas for expressing small color differences in a single number have been reported. Each depends upon the specification of color in terms of a defined color space. The more nearly this color space represents uniform visual spacing, the better the resulting expression of "small-difference" or "color tolerance" or "fading" should be.

Whether small differences specified in terms of the three variables of each of these color space concepts can be added or not to provide a single number specification of total difference that will hold under careful theoretical scrutiny is a question. It is, however, a fact that formulas based on very simple mathematical treatment have been found to hold in practical application as well or better than more complicated formulas yet devised.

A series of papers and discussions resulting from an Inter-Society Color Council Symposium on Small Color Differences was published in 1944 in the AMERICAN DYESTUFF REPORTER, May 22, June 5-19, July 3. These papers include a listing of six formulas and a discussion of their meaning and derivation in a paper by Nickerson *(3)*. These formulas are also discussed and listed in an ISCC symposium on color held with the Technical Association of the Pulp and Paper Industry in 1947 *(4)*.

Three types of formula are available for use. These are based on the Munsell 3-dimensional concept of hue, value, chroma; a 3-dimensional concept combining Judd's UCS diagram with a scale of lightness ($L = Y^{1/3}$); and a 3-dimensional concept based on proposals by E. Q. Adams. In a detailed report *(5)* of applications of all six formulas to 11 groups of colors, it was concluded that since correlation of results of these small-difference formulas against visual observations showed no great advantage of one formula over another, the formula to be selected for use should depend upon the form of one's color data. R^2, used as a measure of correlation[1], varied from 0.60 for the Munsell formula to 0.53 for the Judd, and 0.52 and 0.54 for the Adams' formulas. Therefore, if the data are in Munsell notation, use the Nickerson or Nickerson-Balinkin formula; if the data are in Hunter terms, use the Judd-Hunter-Scofield formulas; if the data are in I.C.I. terms, use one of the formulas developed by Balinkin on the basis of Adams' proposals. To the six formulas studied another should be added, one based on a modified chromatic value space, as proposed by Saunderson and Milner *(6)*.

Much of the color specification work in the textile industry is based on spectrophotometric measurement, and because of this, colorimetric data are usually avail-

[1] Simple linear correlation is expressed by R. The R^2 figure was used in (*5*) because it seems to present a better picture of the situation than is warranted by the R data which range from 0.72 to 0.77.

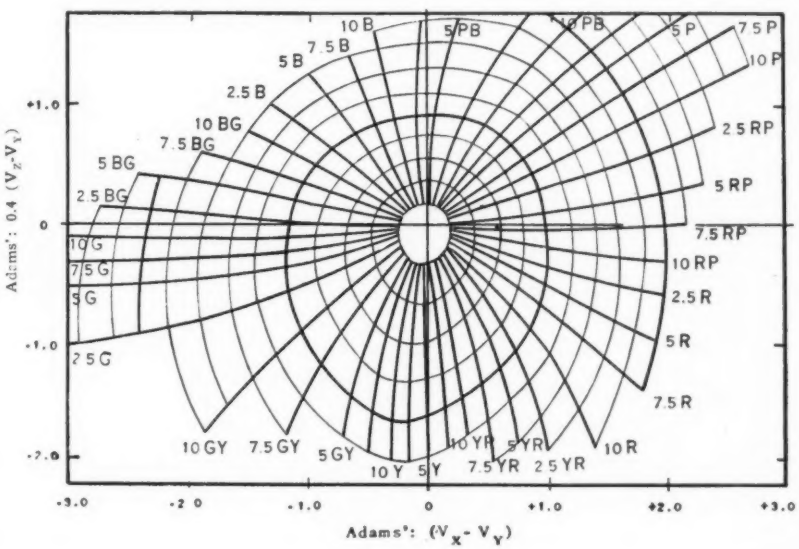

Figure 1

able in I.C.I. (X, Y, Z)-terms. The small-difference formula most easily and rapidly applicable to I.C.I. data is the following, which is based on the color space described by Adams as "chromatic value." Note that the formula is applied to the I.C.I. tristimulus values (X, Y, Z), not to chromaticity coordinates (x, y, z).

$$\triangle E_A = f \left\{ (0.23 \triangle V_Y)^2 + [\triangle (V_X - V_Y)]^2 + [0.4 \triangle (V_Z - V_Y)]^2 \right\}^{\frac{1}{2}} \qquad (1)$$

In "chromatic value" space the coordinates are V_Y, $(V_X - V_Y)$, $(V_Z - V_Y)$, V being the Munsell value function recommended by the O.S.A. subcommittee on spacing of the Munsell colors. The resulting space has the same vertical dimension as Munsell space. When Munsell renotations are converted to Adams' space, and the Adams' $(V_X - V_Y)$ is plotted against 2.5 times the scale for $(V_Z - V_Y)$, as in Figure 1, the radial distance from the illuminant point correlates well with Munsell chroma along any one Munsell hue radius. However, equal distance in chroma differs somewhat for different hues as is shown by succeeding ovoids from the center, each of which represents two steps of Munsell chroma, the heavy lines indicating chromas at /10 and at /20. In any concept used as a basis for "small difference" specification equal chroma distances for all hues is a desired feature. An improvement on the Adams' formula in this respect is suggested by the Saunderson-Milner modification of Adams' "chromatic value space." A slide rule and graph developed by Saunderson and Milner *(6)* simplify the calculations. The formula based on this Saunderson-Milner modification is:

$$\triangle E_{S\text{-}M} = [(\triangle \zeta_1)^2 + (\triangle \zeta_2)^2 + (\triangle \zeta_3)^2]^{\frac{1}{2}} \qquad (2)$$

where $\zeta_1 = (V_X - V_Y)(9.37 + 0.79 \cos \theta)$

$\zeta_3 = (V_Z - V_Y)(3.33 + 0.87 \sin \theta)$

$\zeta_2 = kV$

and k may vary from 2 to 10, depending on conditions of viewing. If (2) is used, reference should be made to Saunderson and Milner's original paper. In a private communication (June 6, 1950), Dr. Saunderson suggests that an important simplification in the use of zeta equations for expressing color differences can be made without loss of accuracy by obtaining the quantities $(9.37 + 0.79 \cos \theta)$ and $3.33 + 0.87 \sin \theta)$ for the standard only (or for one of a group of colors, and ignoring the variation in θ among samples that are fairly close together in color space. After the quantities containing the trigonometric functions have been evaluated for a standard color, Dr. Saunderson reports that the calculation of color differences from the standard is very little more work than by use of formula (1).

In this connection it may be of interest to note that T. F. Boyd, in a study of Color Tolerance Specifications for Paint made at the Industrial Test Laboratory of the Philadelphia Naval Shipyard, finds that rank correlations of results based on formulas versus visual test results, show the Saunderson-Milner adaptation to give results of about the same order as those based on use of the Nickerson index.

The choice between use of formula (1) and (2) remains with the individual worker who must decide whether any increase in correlation with visual judgment is sufficient to balance out the extra work involved in using (2). If the work can be sufficiently reduced, then the Saunderson-Milner formula is the one to be preferred.[2]

Meanwhile, however, formula (1) has been used by a number of textile workers, including Godlove *(1)* and Vickerstaff and Tough *(7)*. In this formula the numbers 0.23 and 0.4 are scale factors that relate the three measures of Adams' "chromatic value" space quite closely to Munsell space. The added factor (f) is included because the unit of difference that results from the above formula is so extremely small. In studying the relation of the units resulting from six formulas, Nickerson and Stultz provided a factor for each of the six[3] that would average the difference in unit between the first Nickerson and Judd units. The early Index of Fading unit was set by Nickerson to equal about 1/3 of a Munsell chroma step, a difference that members of the silk committee of ASTM's Committee D-13 (for whom the formula was developed) thought to be important. The Judd, or NBS unit, was set to indicate a color difference of some commercial importance. If a factor of 1.164 is applied to the Nickerson unit, and one of 0.907 to the Judd unit, then the factor to be applied to the "chromatic value" unit is 41.854 to give them all the same unit of difference. The need for carrying these adjustments beyond two places is not justified, in fact it is suggested that this factor be rounded off to 40. Vickerstaff has used a factor of 42; Godlove used a factor of 10, but that may have been because he overlooked the provision of this factor in the Nickerson-Stultz report, and used a simple number to get a unit nearer to a useful size. If the unit of importance is as little as 0.1 Munsell chroma step, then 10 might be preferable to 40. However, since use of 40 would provide small difference numbers that would be closely in line with the number resulting from formulas based on the Nickerson and Judd formulas, it might be an advantage to use f = 40 in the formula for computing small color difference on a basis of Adams' "chromatic value" ($\triangle E_A$ so that results based on all formulas might be of the same order.

When using the "chromatic value" formula it is convenient to convert I.C.I. (X, Y, Z)-factors to V_X, V_Y, V_Z by use of Tables I, II, and III. Table I is taken directly from the O.S.A. subcommittee report on spacing of the Munsell system *(2);* it is a table showing the relation of Munsell value to I.C.I. Y, as it is usually computed from spectrophotometric data, using MgO as 100. Since MgO is not 100 percent on a scale of Absolute Reflectance, and since Munsell 10/ value is set for Absolute Reflectance, MgO thereby becomes Munsell N 9.90/.

In order to plot neutrals at the center of the coordinate system, it is necessary in using the "chromatic value" formula to make X = Y = Z for whatever illuminant is to be used. On the usual I.C.I. (x, y)-diagram, only Equal Energy is plotted at the center of the diagram. When the selected ordinate method is used to compute spectrophotometric data the sums are first totaled on the basis of X = Y = Z, so that a factor must be included to adjust the final totals to agree with the required position of the illuminant on the (x, y)-diagram. On the other hand, when the weighted ordinate method of computation is used, the adjustments are already included in the computational tables. For example, for illuminant C, the sums for the white point are X = 0.9804, Y = 1.000, Z = 1.1181. If one uses the selected ordinate method of computing spectrophotometric data he need only use Table I, applying it to the totals for X, Y and Z before adjustment by the above factors. But for the usual case in which X, Y, and Z are already adjusted for C illuminant, V_Y should be read from Table I, V_X from Table II, and V_Z from Table III.[4]

[2] For a comparison of color systems with respect to uniform visual spacing, see paper by R. W. Burnham, *Optical Soc. Amer. Jour.* 39, 387-392 (1949).

[3] The numerical constants of the zeta equations of Saunderson and Milner have been adjusted so that the unit used is equal to one Munsell chroma step. Presumably then, the constant should be 1/3 of that used for the Nickerson formula.

[4] If an illuminant other than "C" is used, the V_X, V_Z tables will need to be specially prepared in order to make the required adjustment to X = Y = Z for the illuminant point.

TABLE I

I.C.I. (Y) EQUIVALENT (IN PERCENTAGE RELATIVE TO MgO) OF THE MUNSELL VALUE SCALE (V) FOR 0/ TO 10/

V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y	V_Y	Y
10.00	102.57																		
9.99	102.30	8.99	78.45	7.99	58.92	6.99	42.92	5.99	29.94	4.99	19.68	3.99	11.935	2.99	6.511	1.99	3.100	0.99	1.196
8	102.04	8	78.23	8	58.74	8	42.77	8	29.82	8	19.59	8	11.870	8	6.468	8	3.075	8	1.182
7	101.78	7	78.02	7	58.57	7	42.63	7	29.71	7	19.50	7	11.805	7	6.425	7	3.050	7	1.168
6	101.52	6	77.80	6	58.39	6	42.49	6	29.59	6	19.41	6	11.740	6	6.382	6	3.025	6	1.154
5	101.25	5	77.59	5	58.22	5	42.34	5	29.48	5	19.32	5	11.675	5	6.339	5	3.000	5	1.141
9.94	100.99	8.94	77.38	7.94	58.04	6.94	42.20	5.94	29.36	4.94	19.23	3.94	11.611	2.94	6.296	1.94	2.975	0.94	1.128
3	100.73	3	77.16	3	57.87	3	42.06	3	29.25	3	19.14	3	11.547	3	6.254	3	2.950	3	1.114
2	100.47	2	76.95	2	57.69	2	41.92	2	29.13	2	19.06	2	11.483	2	6.212	2	2.925	2	1.101
1	100.21	1	76.74	1	57.52	1	41.77	1	29.02	1	18.97	1	11.419	1	6.170	1	2.901	1	1.087
0	99.95	0	76.53	0	57.35	0	41.63	0	28.90	0	18.88	0	11.356	0	6.128	0	2.877	0	1.074
9.89	99.69	8.89	76.32	7.89	57.17	6.89	41.49	5.89	28.79	4.89	18.79	3.89	11.292	2.89	6.086	1.89	2.853	0.89	1.060
8	99.44	8	76.11	8	57.00	8	41.35	8	28.68	8	18.70	8	11.229	8	6.045	8	2.829	8	1.047
7	99.18	7	75.90	7	56.83	7	41.21	7	28.57	7	18.62	7	11.167	7	6.003	7	2.805	7	1.034
6	98.92	6	75.69	6	56.66	6	41.07	6	28.45	6	18.53	6	11.104	6	5.962	6	2.781	6	1.021
5	98.66	5	75.48	5	56.48	5	40.93	5	28.34	5	18.44	5	11.042	5	5.921	5	2.758	5	1.008
9.84	98.41	8.84	75.27	7.84	56.31	6.84	40.79	5.84	28.23	4.84	18.36	3.84	10.980	2.84	5.881	1.84	2.735	0.84	0.995
3	98.15	3	75.06	3	56.14	3	40.65	3	28.12	3	18.27	3	10.918	3	4.841	3	2.712	3	.982
2	97.90	2	74.85	2	55.97	2	40.51	2	28.01	2	18.19	2	10.856	2	5.800	2	2.688	2	.969
1	97.64	1	74.64	1	55.80	1	40.37	1	27.90	1	18.10	1	10.795	1	5.760	1	2.665	1	.956
0	97.39	0	74.44	0	55.63	0	40.23	0	27.78	0	18.02	0	10.734	0	5.720	0	2.642	0	.943
9.79	97.14	8.79	74.23	7.79	55.46	6.79	40.09	5.79	27.67	4.79	17.93	3.79	10.673	2.79	5.680	1.79	2.620	0.79	.931
8	96.88	8	74.02	8	55.29	8	39.95	8	27.56	8	17.85	8	10.612	8	5.641	8	2.598	8	.918
7	96.63	7	73.82	7	55.12	7	39.82	7	27.45	7	17.76	7	10.551	7	5.602	7	2.575	7	.906
6	96.38	6	73.61	6	54.95	6	39.68	6	27.34	6	17.68	6	10.491	6	5.563	6	2.553	6	.893
5	96.13	5	73.40	5	54.78	5	39.54	5	27.23	5	17.60	5	10.431	5	5.524	5	2.531	5	.881
9.74	95.88	8.74	73.20	7.74	54.62	6.74	39.40	5.74	27.12	4.74	17.51	3.74	10.371	2.74	5.485	1.74	2.509	0.74	.868
3	95.63	3	72.99	3	54.45	3	39.27	3	27.02	3	17.43	3	10.311	3	5.447	3	2.487	3	.856
2	95.38	2	72.79	2	54.28	2	39.13	2	26.91	2	17.34	2	10.252	2	5.408	2	2.465	2	.844
1	95.13	1	72.59	1	54.11	1	39.00	1	26.80	1	17.26	1	10.193	1	5.370	1	2.443	1	.832
0	94.88	0	72.38	0	53.94	0	38.86	0	26.69	0	17.18	0	10.134	0	5.332	0	2.422	0	.819
9.69	94.63	8.69	72.18	7.69	53.78	6.69	38.72	5.69	26.58	4.69	17.10	3.69	10.075	2.69	5.295	1.69	2.401	0.69	.807
8	94.38	8	71.98	8	53.61	8	38.59	8	26.48	8	17.02	8	10.017	8	5.257	8	2.380	8	.795
7	94.14	7	71.78	7	53.45	7	38.45	7	26.37	7	16.93	7	9.959	7	5.220	7	2.359	7	.783
6	93.89	6	71.57	6	53.28	6	38.32	6	26.26	6	16.85	6	9.901	6	5.183	6	2.338	6	.771
5	93.64	5	71.37	5	53.12	5	38.18	5	26.15	5	16.77	5	9.843	5	5.146	5	2.317	5	.759
9.64	93.40	8.64	71.17	7.64	52.95	6.64	38.05	5.64	26.05	4.64	16.69	3.64	9.785	2.64	5.109	1.64	2.296	0.64	.747
3	93.15	3	70.97	3	52.79	3	37.92	3	25.94	3	16.61	3	9.728	3	5.072	3	2.276	3	.735
2	92.91	2	70.77	2	52.62	2	37.78	2	25.84	2	16.53	2	9.671	2	5.036	2	2.256	2	.723
1	92.66	1	70.57	1	52.46	1	37.65	1	25.73	1	16.45	1	9.614	1	5.000	1	2.236	1	.711
0	92.42	0	70.37	0	52.30	0	37.52	0	25.62	0	16.37	0	9.557	0	4.964	0	2.216	0	.699
9.59	92.18	8.59	70.17	7.59	52.13	6.59	37.38	5.59	25.52	4.59	16.29	3.59	9.501	2.59	4.928	1.59	2.196	0.59	.687
8	91.93	8	69.97	8	51.97	8	37.25	8	25.41	8	16.21	8	9.445	8	4.892	8	2.176	8	.675
7	91.69	7	69.78	7	51.81	7	37.12	7	25.31	7	16.13	7	9.389	7	4.857	7	2.156	7	.663
6	91.45	6	69.58	6	51.64	6	36.99	6	25.20	6	16.05	6	9.333	6	4.822	6	2.136	6	.651
5	91.21	5	69.38	5	51.48	5	36.86	5	25.10	5	15.97	5	9.277	5	4.787	5	2.116	5	.640
9.54	90.97	8.54	69.18	7.54	51.32	6.54	36.72	5.54	25.00	4.54	15.89	3.54	9.222	2.54	4.752	1.54	2.097	0.54	.628
3	90.73	3	68.99	3	51.16	3	36.59	3	24.89	3	15.81	3	9.167	3	4.717	3	2.078	3	.617
2	90.49	2	68.79	2	51.00	2	36.46	2	24.79	2	15.74	2	9.112	2	4.682	2	2.059	2	.605
1	90.25	1	68.59	1	50.84	1	36.33	1	24.69	1	15.66	1	9.058	1	4.648	1	2.040	1	.593
0	90.01	0	68.40	0	50.68	0	36.20	0	24.58	0	15.57	0	9.003	0	4.614	0	2.021	0	.581
9.49	89.77	8.49	68.20	7.49	50.52	6.49	36.07	5.49	24.48	4.49	15.49	3.49	8.949	2.49	4.580	1.49	2.002	0.49	.570
8	89.53	8	68.01	8	50.36	8	35.94	8	24.38	8	15.42	8	8.895	8	4.546	8	1.983	8	.559
7	89.30	7	67.81	7	50.20	7	35.81	7	24.28	7	15.34	7	8.841	7	4.512	7	1.965	7	.547
6	89.06	6	67.62	6	50.04	6	35.68	6	24.17	6	15.26	6	8.787	6	4.479	6	1.947	6	.535
5	88.82	5	67.43	5	49.88	5	35.56	5	24.07	5	15.18	5	8.734	5	4.446	5	1.929	5	.524
9.44	88.59	8.44	67.23	7.44	49.72	6.44	35.43	5.44	23.97	4.44	15.11	3.44	8.681	2.44	4.413	1.44	1.910	0.44	.513
3	88.35	3	67.04	3	49.56	3	35.30	3	23.87	3	15.03	3	8.628	3	4.380	3	1.892	3	.501
2	88.12	2	66.85	2	49.41	2	35.17	2	23.77	2	14.96	2	8.575	2	4.347	2	1.874	2	.489
1	87.88	1	66.66	1	49.25	1	35.04	1	23.67	1	14.88	1	8.523	1	4.314	1	1.856	1	.478
0	87.65	0	66.46	0	49.09	0	34.92	0	23.57	0	14.81	0	8.471	0	4.282	0	1.838	0	.467
9.39	87.41	8.39	66.27	7.39	48.93	6.39	34.79	5.39	23.47	4.39	14.73	3.39	8.419	2.39	4.250	1.39	1.821	0.39	.455
8	87.18	8	66.08	8	48.78	8	34.66	8	23.37	8	14.66	8	8.367	8	4.218	8	1.803	8	.444
7	86.95	7	65.89	7	48.62	7	34.54	7	23.27	7	14.58	7	8.316	7	4.186	7	1.786	7	.432
6	86.72	6	65.70	6	48.47	6	34.41	6	23.17	6	14.51	6	8.264	6	4.154	6	1.769	6	.421
5	86.48	5	65.51	5	48.31	5	34.28	5	23.07	5	14.43	5	8.213	5	4.123	5	1.752	5	.409
9.34	86.25	8.34	65.32	7.34	48.16	6.34	34.16	5.34	22.97	4.34	14.36	3.34	8.162	2.34	4.092	1.34	1.735	0.34	.398
3	86.02	3	65.13	3	48.00	3	34.03	3	22.87	3	14.28	3	8.111	3	4.060	3	1.718	3	.386
2	85.79	2	64.94	2	47.85	2	33.91	2	22.78	2	14.21	2	8.060	2	4.029	2	1.701	2	.375
1	85.56	1	64.76	1	47.69	1	33.78	1	22.68	1	14.14	1	8.010	1	3.998	1	1.684	1	.363
0	85.33	0	64.57	0	47.54	0	33.66	0	22.58	0	14.07	0	7.960	0	3.968	0	1.667	0	.352
9.29	85.10	8.29	64.38	7.29	47.38	6.29	33.54	5.29	22.48	4.29	13.99	3.29	7.910	2.29	3.938	1.29	1.650	0.29	.341
8	84.88	8	64.19	8	47.23	8	33.41	8	22.38	8	13.92	8	7.860	8	3.907	8	1.634	8	.329
7	84.65	7	64.01	7	47.08	7	33.29	7	22.29	7	13.85	7	7.811	7	3.877	7	1.618	7	.318
6	84.42	6	63.82	6	46.92	6	33.16	6	22.19	6	13.78	6	7.762	6	3.847	6	1.601	6	.306
5	84.19	5	63.63	5	46.77	5	33.04	5	22.09	5	13.70	5	7.713	5	3.817	5	1.585	5	.295
9.24	83.97	8.24	63.45	7.24	46.62	6.24	32.92	5.24	22.00	4.24	13.63	3.24	7.664	2.24	3.787	1.24	1.569	0.24	.283
3	83.74	3	63.26	3	46.47	3	32.80	3	21.90	3	13.56	3	7.615	3	3.758	3	1.553	3	.272
2	83.52	2	63.08	2	46.32	2	32.67	2	21.81	2	13.49	2	7.567	2	3.729	2	1.537	2	.260
1	83.29	1	62.89	1	46.17	1	32.55	1	21.71	1	13.42	1	7.519	1	3.700	1	1.521	1	.248
0	83.07	0	62.71	0	46.02	0	32.43	0	21.62	0	13.35	0	7.471	0	3.671	0	1.506	0	.237
9.19	82.84	8.19	62.52	7.19	45.87	6.19	32.31	5.19	21.52	4.19	13.28	3.19	7.423	2.19	3.642	1.19	1.490	0.19	.225
8	82.62	8	62.34	8	45.72	8	32.19	8	21.43	8	13.21	8	7.375	8	3.613	8	1.475	8	.214
7	82.39	7	62.16	7	45.57	7	32.07	7	21.33	7	13.14	7	7.328	7	3.585	7	1.459	7	.202
6	82.17	6	61.98	6	45.42	6	31.95	6	21.24	6	13.07	6	7.281	6	3.557	6	1.444	6	.191
5	81.95	5	61.79	5	45.27	5	31.83	5	21.14	5	13.00	5	7.234	5	3.529	5	1.429	5	.179
9.14	81.73	8.14	61.61	7.14	45.12	6.14	31.71	5.14	21.05	4.14	12.93	3.14	7.187	2.14	3.501	1.14	1.413	0.14	.167
3	81.50	3	61.43	3	44.97	3	31.59	3	20.96	3	12.86	3	7.140	3	3.473	3	1.398	3	.155
2	81.28	2	61.25	2	44.82	2	31.47	2	20.86	2	12.80	2	7.094	2	3.445	2	1.383	2	.143
1	81.06	1	61.07	1	44.67	1	31.35	1	20.77	1	12.73	1	7.048	1	3.418	1	1.368	1	.131
0	80.84	0	60.88	0	44.52	0	31.23	0	20.68	0	12.66	0	7.002	0	3.391	0	1.354	0	.120
9.09	80.62	8.09	60.70	7.09	44.38	6.09	31.11	5.09	20.59	4.09	12.59	3.09	6.956	2.09	3.364	1.09	1.339	0.09	.108
8	80.40	8	60.52	8	44.23	8	30.99	8	20.49	8	12.52	8	6.911	8	3.337	8	1.324	8	.096
7	80.18	7	60.35	7	44.08	7	30.87	7	20.40	7	12.46	7	6.866	7	3.310	7	1.310	7	.084
6	79.97	6	60.17	6	43.94	6	30.75	6	20.31	6	12.39	6	6.821	6	3.283	6	1.295	6	.073
5	79.75	5	59.99	5	43.79	5	30.64	5	20.22	5	12.32	5	6.776	5	3.256	5	1.281	5	.061
9.04	79.53	8.04	59.81	7.04	43.64	6.04	30.52	5.04	20.13	4.04	12.26	3.04	6.731	2.04	3.230	1.04	1.267	0.04	.049
3	79.31	3	59.63	3	43.50	3	30.40	3	20.04	3	12.19	3	6.687	3	3.204	3	1.253	3	.036
2	79.10	2	59.45	2	43.35	2	30.28	2	19.95	2	12.12	2	6.643	2	3.178	2	1.238	2	.024
1	78.88	1	59.28	1	43.21	1	30.17	1	19.86	1	12.06	1	6.599	1	3.152	1	1.224	1	.012
0	78.66	0	59.10	0	43.06	0	30.05	0	19.77	0	12.00	0	6.555	0	3.126	0	1.210	0	.000

1950)

TABLE II

I.C.I. X_C EQUIVALENT* OF THE MUNSELL VALUE SCALE (V)

V_X	Y	V_X	Y	V_X	Y	V_X	Y	V_X	Y	V_X	Y	V_X	Y	V_X	Y	V_X	Y
10.00	100.56																
9.99	100.30	8.99	76.91	7.99	57.77	6.99	42.08	5.99	29.35	4.99	19.29	3.99	11.701	2.99	6.383	1.99	3.039	0.99	1.173
8	100.04	8	76.70	8	57.59	8	41.93	8	29.24	8	19.21	8	11.637	8	6.341	8	3.015	8	1.159
7	99.79	7	76.49	7	57.42	7	41.79	7	29.13	7	19.12	7	11.574	7	6.299	7	2.990	7	1.145
6	99.53	6	76.28	6	57.25	6	41.65	6	29.01	6	19.03	6	11.510	6	6.257	6	2.966	6	1.131
5	99.27	5	76.07	5	57.08	5	41.51	5	28.90	5	18.94	5	11.446	5	6.215	5	2.941	5	1.119
9.94	99.01	8.94	75.86	7.94	56.91	6.94	41.37	5.94	28.79	4.94	18.85	3.94	11.383	2.94	6.173	1.94	2.917	0.94	1.106
3	98.76	3	75.65	3	56.74	3	41.24	3	28.68	3	18.77	3	11.321	3	6.131	3	2.892	3	1.092
2	98.50	2	75.44	2	56.56	2	41.10	2	28.56	2	18.69	2	11.258	2	6.090	2	2.868	2	1.079
1	98.25	1	75.24	1	56.39	1	40.95	1	28.45	1	18.60	1	11.195	1	6.049	1	2.844	1	1.066
0	97.99	0	75.03	0	56.22	0	40.81	0	28.34	0	18.51	0	11.133	0	6.008	0	2.821	0	1.053
9.89	97.74	8.89	74.82	7.89	56.05	6.89	40.68	5.89	28.23	4.89	18.42	3.89	11.071	2.89	5.967	1.89	2.797	0.89	1.039
8	97.49	8	74.62	8	55.88	8	40.54	8	28.12	8	18.34	8	11.009	8	5.926	8	2.774	8	1.026
7	97.24	7	74.41	7	55.72	7	40.40	7	28.01	7	18.26	7	10.947	7	5.885	7	2.750	7	1.014
6	96.98	6	74.21	6	55.55	6	40.27	6	27.89	6	18.17	6	10.886	6	5.845	6	2.727	5	1.001
5	96.73	5	74.00	5	55.38	5	40.13	5	27.78	5	18.08	5	10.826	5	5.805	5	2.704	5	0.988
9.84	96.48	8.84	73.80	7.84	55.21	6.84	39.99	5.84	27.68	4.84	18.00	3.84	10.765	2.84	5.766	1.84	2.681	0.84	.976
3	96.23	3	73.59	3	55.04	3	39.85	3	27.57	3	17.91	3	10.704	3	5.726	3	2.658	3	.963
2	95.98	2	73.38	2	54.87	2	39.72	2	27.46	2	17.83	2	10.643	2	5.686	2	2.635	2	.950
1	95.73	1	73.18	1	54.71	1	39.58	1	27.35	1	17.75	1	10.583	1	5.647	1	2.613	1	.937
0	95.48	0	72.98	0	54.54	0	39.44	0	27.24	0	17.67	0	10.524	0	5.608	0	2.590	0	.925
9.79	95.23	8.79	72.78	7.79	54.37	6.79	39.30	5.79	27.13	4.79	17.58	3.79	10.464	2.79	5.569	1.79	2.568	0.79	.913
8	94.98	8	72.57	8	54.21	8	39.17	8	27.02	8	17.50	8	10.404	8	5.530	8	2.547	8	.900
7	94.74	7	72.37	7	54.04	7	39.04	7	26.91	7	17.41	7	10.344	7	5.492	7	2.525	7	.888
6	94.49	6	72.17	6	53.87	6	38.90	6	26.80	6	17.33	6	10.285	6	5.454	6	2.503	6	.876
5	94.25	5	71.96	5	53.71	5	38.77	5	26.70	5	17.25	5	10.227	5	5.416	5	2.481	5	.864
9.74	94.00	8.74	71.76	7.74	53.55	6.74	38.63	5.74	26.59	4.74	17.17	3.74	10.168	2.74	5.378	1.74	2.460	0.74	.851
3	93.76	3	71.56	3	53.38	3	38.50	3	26.49	3	17.09	3	10.109	3	5.340	3	2.438	3	.839
2	93.51	2	71.36	2	53.22	2	38.36	2	26.38	2	17.00	2	10.051	2	5.302	2	2.417	2	.827
1	93.27	1	71.16	1	53.05	1	38.23	1	26.27	1	16.92	1	9.993	1	5.265	1	2.395	1	.815
0	93.02	0	70.96	0	52.89	0	38.10	0	26.17	0	16.84	0	9.935	0	5.228	0	2.375	0	.803
9.69	92.78	8.69	70.77	7.69	52.73	6.69	37.96	5.69	26.06	4.69	16.76	3.69	9.878	2.69	5.191	1.69	2.354	0.69	.791
8	92.53	8	70.57	8	52.56	8	37.83	8	25.96	8	16.68	8	9.821	8	5.154	8	2.333	8	.779
7	92.29	7	70.37	7	52.40	7	37.70	7	25.85	7	16.60	7	9.764	7	5.118	7	2.313	7	.768
6	92.05	6	70.17	6	52.24	6	37.57	6	25.75	6	16.52	6	9.707	6	5.081	6	2.292	6	.756
5	91.81	5	69.97	5	52.08	5	37.43	5	25.64	5	16.44	5	9.650	5	5.045	5	2.272	5	.744
9.64	91.57	8.64	69.78	7.64	51.91	6.64	37.30	5.64	25.54	4.64	16.36	3.64	9.593	2.64	5.009	1.64	2.251	0.64	.732
3	91.33	3	69.58	3	51.75	3	37.17	3	25.43	3	16.28	3	9.537	3	4.973	3	2.231	3	.721
2	91.09	2	69.38	2	51.59	2	37.04	2	25.33	2	16.21	2	9.482	2	4.937	2	2.212	2	.709
1	90.85	1	69.19	1	51.43	1	36.91	1	25.23	1	16.13	1	9.426	1	4.902	1	2.192	1	.697
0	90.61	0	68.99	0	51.27	0	36.78	0	25.12	0	16.05	0	9.370	0	4.867	0	2.173	0	.685
9.59	90.37	8.59	68.80	7.59	51.11	6.59	36.65	5.59	25.02	4.59	15.97	3.59	9.315	2.58	4.831	1.59	2.153	0.59	.674
8	90.13	8	68.60	8	50.95	8	36.52	8	24.91	8	15.89	8	2.260	8	4.796	8	2.133	8	.662
7	89.89	7	68.41	7	50.79	7	36.39	7	24.81	7	15.81	7	9.205	7	4.762	7	2.114	7	.650
6	89.66	6	68.22	6	50.63	6	36.27	6	24.71	6	15.74	6	9.150	6	4.728	6	2.094	6	.638
5	89.42	5	68.02	5	50.47	5	36.14	5	24.61	5	15.66	5	9.095	5	4.693	5	2.075	5	.627
9.54	89.19	8.54	67.83	7.54	50.31	6.54	36.00	5.54	24.51	4.54	15.58	3.54	9.041	2.54	4.659	1.54	2.056	0.54	.616
3	88.95	3	67.64	3	50.16	3	35.87	3	24.40	3	15.50	3	8.987	3	4.624	3	2.037	3	.605
2	88.72	2	67.44	2	50.00	2	35.75	2	24.30	2	15.43	2	8.933	2	4.590	2	2.019	2	.593
1	88.48	1	67.25	1	49.84	1	35.62	1	24.20	1	15.35	1	8.880	1	4.557	1	2.000	1	.581
0	88.25	0	67.06	0	49.69	0	35.49	0	24.10	0	15.26	0	8.827	0	4.524	0	1.981	0	.570
9.49	88.01	8.49	66.87	7.49	49.53	6.49	35.36	5.49	24.00	4.49	15.18	3.49	8.774	2.49	4.490	1.49	1.963	0.49	.559
8	87.78	8	66.68	8	49.37	8	35.24	8	23.90	8	15.11	8	8.721	8	4.457	8	1.944	8	.548
7	87.55	7	66.48	7	49.22	7	35.11	7	23.80	7	15.04	7	8.668	7	4.424	7	1.926	7	.536
6	87.32	6	66.29	6	49.06	6	34.98	6	23.70	6	14.96	6	8.615	6	4.391	6	1.909	6	.525
5	87.08	5	66.11	5	48.90	5	34.86	5	23.60	5	14.88	5	8.563	5	4.359	5	1.891	5	.514
9.44	86.85	8.44	65.92	7.44	48.75	6.44	34.74	5.44	23.50	4.44	14.81	3.44	8.511	2.44	4.327	1.44	1.873	0.44	.503
3	86.62	3	65.73	3	48.59	3	34.61	3	23.40	3	14.74	3	8.459	3	4.294	3	1.855	3	.491
2	86.39	2	65.54	2	48.44	2	34.48	2	23.30	2	14.67	2	8.407	2	4.261	2	1.837	2	.479
1	86.16	1	65.35	1	48.29	1	34.35	1	23.21	1	14.59	1	8.356	1	4.229	1	1.820	1	.468
0	85.93	0	65.16	0	48.13	0	34.23	0	23.11	0	14.52	0	8.305	0	4.198	0	1.802	0	.458
9.39	85.70	8.39	64.97	7.39	47.97	6.39	34.11	5.39	23.01	4.39	14.44	3.39	8.254	2.39	4.167	1.39	1.785	0.39	.446
8	85.47	8	64.79	8	47.82	8	33.98	8	22.91	8	14.37	8	8.203	8	4.135	8	1.768	8	.435
7	85.25	7	64.60	7	47.67	7	33.86	7	22.81	7	14.29	7	8.153	7	4.104	7	1.751	7	.424
6	85.02	6	64.41	6	47.52	6	33.74	6	22.72	6	14.22	6	8.102	6	4.073	6	1.734	6	.413
5	84.79	5	64.23	5	47.36	5	33.61	5	22.62	5	14.15	5	8.052	5	4.042	5	1.718	5	.401
9.34	84.56	8.34	64.04	7.34	47.21	6.34	33.49	5.34	22.52	4.34	14.08	3.34	8.002	2.34	4.011	1.34	1.701	0.34	.390
3	84.33	3	63.85	3	47.06	3	33.36	3	22.42	3	14.00	3	7.952	3	3.980	3	1.684	3	.378
2	84.10	2	63.67	2	46.91	2	33.24	2	22.33	2	13.93	2	7.902	2	3.950	2	1.668	2	.367
1	83.88	1	63.49	1	46.76	1	33.12	1	22.24	1	13.86	1	7.853	1	3.920	1	1.651	1	.356
0	83.66	0	63.31	0	46.61	0	33.00	0	22.14	0	13.79	0	7.804	0	3.890	0	1.634	0	.345
9.29	83.44	8.29	63.12	7.29	46.45	6.29	32.88	5.29	22.04	4.29	13.72	3.29	7.755	2.29	3.860	1.29	1.618	0.29	.334
8	83.22	8	62.93	8	46.30	8	32.76	8	21.94	8	13.65	8	7.706	8	3.830	8	1.602	8	.323
7	82.99	7	62.75	7	46.15	7	32.64	7	21.85	7	13.58	7	7.658	7	3.801	7	1.586	7	.312
6	82.77	6	62.57	6	46.00	6	32.51	6	21.76	6	13.51	6	7.610	6	3.772	6	1.570	6	.300
5	82.54	5	62.38	5	45.85	5	32.39	5	21.66	5	13.43	5	7.562	5	3.742	5	1.554	5	.289
9.24	82.32	8.24	62.20	7.24	45.71	6.24	32.28	5.24	21.57	4.24	13.36	3.24	7.514	2.24	3.713	1.24	1.538	0.24	.277
3	82.10	3	62.02	3	45.56	3	32.16	3	21.47	3	13.29	3	7.466	3	3.684	3	1.523	3	.266
2	81.88	2	61.84	2	45.41	2	32.03	2	21.38	2	13.23	2	7.419	2	3.656	2	1.507	2	.255
1	81.66	1	61.66	1	45.27	1	31.91	1	21.29	1	13.16	1	7.372	1	3.628	1	1.491	1	.243
0	81.44	0	61.48	0	45.12	0	31.79	0	21.20	0	13.09	0	7.325	0	3.599	0	1.476	0	.232
9.19	81.22	8.19	61.30	7.19	44.97	6.19	31.68	5.19	21.10	4.19	13.02	3.19	7.278	2.19	3.571	1.19	1.461	0.19	.221
8	81.00	8	61.12	8	44.82	8	31.56	8	21.01	8	12.95	8	7.231	8	3.542	8	1.446	8	.210
7	80.78	7	60.94	7	44.68	7	31.44	7	20.91	7	12.88	7	7.184	7	3.514	7	1.430	7	.198
6	80.56	6	60.76	6	44.53	6	31.32	6	20.82	6	12.81	6	7.138	6	3.487	6	1.416	6	.187
5	80.34	5	60.58	5	44.38	5	31.21	5	20.73	5	12.75	5	7.092	5	3.460	5	1.401	5	.175
9.14	80.12	8.14	60.40	7.14	44.24	6.14	31.09	5.14	20.64	4.14	12.68	3.14	7.046	2.14	3.432	1.14	1.385	0.14	.164
3	79.90	3	60.23	3	44.09	3	30.97	3	20.55	3	12.61	3	7.000	3	3.405	3	1.370	3	.152
2	79.69	2	60.05	2	43.94	2	30.85	2	20.45	2	12.55	2	6.955	2	3.378	2	1.356	2	.140
1	79.47	1	59.87	1	43.79	1	30.74	1	20.36	1	12.48	1	6.910	1	3.351	1	1.341	1	.128
0	79.26	0	59.69	0	43.65	0	30.62	0	20.27	0	12.41	0	6.865	0	3.325	0	1.327	0	.117
9.09	79.04	8.09	59.51	7.09	43.51	6.09	30.50	5.09	20.18	4.09	12.34	3.09	6.820	2.09	3.298	1.09	1.313	0.09	.106
8	78.82	8	59.34	8	43.36	8	30.38	8	20.09	8	12.28	8	6.776	8	3.272	8	1.298	8	.094
7	78.61	7	59.17	7	43.22	7	30.27	7	20.00	7	12.22	7	6.731	7	3.245	7	1.284	7	.082
6	78.40	6	58.99	6	43.08	6	30.15	6	19.91	6	12.15	6	6.687	6	3.219	6	1.270	6	.071
5	78.19	5	58.81	5	42.93	5	30.04	5	19.82	5	12.08	5	6.643	5	3.192	5	1.256	5	.060
9.04	77.97	8.04	58.64	7.04	42.79	6.04	29.92	5.04	19.74	4.04	12.02	3.04	6.599	2.04	3.166	1.04	1.242	0.04	.048
3	77.76	3	58.46	3	42.65	3	29.80	3	10.65	3	11.95	3	6.556	3	3.141	3	1.228	3	.035
2	77.55	2	58.29	2	42.50	2	29.69	2	19.56	2	11.88	2	6.513	2	3.116	2	1.214	2	.023
1	77.33	1	58.12	1	42.36	1	29.58	1	19.47	1	11.82	1	6.470	1	3.090	1	1.200	1	.012
0	77.12	0	57.94	0	42.22	0	29.46	0	19.38	0	11.76	0	6.427	0	3.064	0	1.186	0	.000

*0.98041 Y.

(1950)

Table III

Z_c Equivalent* of the Munsell Value Scale (V)

V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y	V_Z	Y
10.00	121.14																		
9.99	120.82	8.99	92.65	7.99	69.59	6.99	50.69	5.99	35.36	4.99	23.24	3.99	14.096	2.99	7.690	1.99	3.661	0.99	1.413
8	120.51	8	93.39	8	69.38	8	50.52	8	35.22	8	23.14	8	14.019	8	7.639	8	3.631	8	1.396
7	120.21	7	92.14	7	69.17	7	50.35	7	35.09	7	23.03	7	13.942	7	7.588	7	3.602	7	1.379
6	119.90	6	91.89	6	68.96	6	50.18	6	34.95	6	22.92	6	13.865	6	7.537	6	3.573	6	1.363
5	119.58	5	91.64	5	68.76	5	50.01	5	34.82	5	22.82	5	13.789	5	7.487	5	3.543	5	1.348
9.94	119.27	8.94	91.39	7.94	68.55	6.94	49.84	5.94	34.68	4.94	22.71	3.94	13.713	2.94	7.436	1.94	3.514	0.94	1.332
3	118.97	3	91.13	3	68.35	3	49.67	3	34.55	3	22.60	3	13.637	3	7.386	3	3.484	3	1.316
2	118.66	2	90.88	2	68.14	2	49.50	2	34.41	2	22.50	2	13.562	2	7.337	2	3.455	2	1.300
1	118.35	1	90.63	1	67.93	1	49.33	1	34.27	1	22.40	1	13.486	1	7.287	1	3.426	1	1.284
0	118.04	0	90.38	0	67.73	0	49.17	0	34.13	0	22.30	0	13.412	0	7.237	0	3.398	0	1.268
9.89	117.74	8.89	90.14	7.89	67.52	6.89	49.00	5.89	34.00	4.89	22.19	3.89	13.336	2.89	7.188	1.89	3.369	0.89	1.252
8	117.44	8	89.89	8	67.32	8	48.84	8	33.87	8	22.09	8	13.262	8	7.139	8	3.341	8	1.237
7	117.13	7	89.64	7	67.12	7	48.67	7	33.74	7	21.99	7	13.188	7	7.090	7	3.312	7	1.221
6	116.83	6	89.39	6	66.92	6	48.50	6	33.60	6	21.88	6	13.114	6	7.041	6	3.284	6	1.206
5	116.52	5	89.14	5	66.71	5	48.34	5	33.47	5	21.78	5	13.041	5	6.993	5	3.257	5	1.190
9.84	116.22	8.84	88.90	7.84	66.50	6.84	48.17	5.84	33.34	4.84	21.68	3.84	12.968	2.84	6.946	1.84	3.230	0.84	1.175
3	115.92	3	88.65	3	66.30	3	48.01	3	33.21	3	21.58	3	12.894	3	6.898	3	3.203	3	1.160
2	115.62	2	88.40	2	66.10	2	47.84	2	33.08	2	21.48	2	12.821	2	6.850	2	3.175	2	1.144
1	115.32	1	88.15	1	65.90	1	47.68	1	32.95	1	21.38	1	12.749	1	6.803	1	3.147	1	1.129
0	115.02	0	87.91	0	65.70	0	47.51	0	32.81	0	21.28	0	12.677	0	6.755	0	3.120	0	1.114
9.79	114.72	8.79	87.67	7.79	65.50	6.79	47.35	5.79	32.68	4.79	21.18	3.79	12.605	2.79	6.708	1.79	3.094	0.79	1.099
8	114.42	8	87.42	8	65.30	8	47.19	8	32.55	8	21.08	8	12.533	8	6.662	8	3.068	8	1.084
7	114.12	7	87.18	7	65.10	7	47.03	7	32.42	7	20.98	7	12.461	7	6.616	7	3.041	7	1.070
6	113.83	6	86.94	6	64.90	6	46.86	6	32.29	6	20.88	6	12.390	6	6.570	6	3.015	6	1.055
5	113.53	5	86.69	5	64.70	5	46.70	5	32.16	5	20.78	5	12.319	5	6.524	5	2.989	5	1.040
9.74	113.24	8.74	86.45	7.74	64.51	6.74	46.54	5.74	32.03	4.74	20.68	3.74	12.248	2.74	6.478	1.74	2.963	0.74	1.025
3	112.94	3	86.21	3	64.31	3	46.38	3	31.91	3	20.58	3	12.178	3	6.433	3	2.937	3	1.011
2	112.65	2	85.97	2	64.11	2	46.21	2	31.78	2	20.48	2	12.108	2	6.387	2	2.911	2	.997
1	112.35	1	85.73	1	63.91	1	46.05	1	31.65	1	20.38	1	12.038	1	6.342	1	2.885	1	.982
0	112.06	0	85.49	0	63.71	0	45.89	0	31.52	0	20.29	0	11.969	0	6.297	0	2.860	0	.967
9.69	111.76	8.69	85.25	7.69	63.51	6.69	45.73	5.69	31.39	4.69	20.20	3.69	11.899	2.69	6.253	1.69	2.836	0.69	.953
8	111.47	8	85.01	8	63.32	8	45.57	8	31.27	8	20.10	8	11.830	8	6.209	8	2.811	8	.939
7	111.18	7	84.77	7	63.13	7	45.41	7	31.14	7	20.00	7	11.762	7	6.165	7	2.786	7	.925
6	110.89	6	84.53	6	62.93	6	45.25	6	31.01	6	19.90	6	11.693	6	6.121	6	2.761	6	.911
5	110.59	5	84.29	5	62.74	5	45.09	5	30.88	5	19.81	5	11.624	5	6.078	5	2.736	5	.896
9.64	110.30	8.64	84.05	7.64	62.54	6.64	44.94	5.64	30.76	4.64	19.71	3.64	11.556	2.64	6.034	1.64	2.712	0.64	.882
3	110.01	3	83.82	3	62.35	3	44.78	3	30.64	3	19.62	3	11.489	3	5.990	3	2.688	3	.868
2	109.72	2	83.58	2	62.15	2	44.62	2	30.52	2	19.52	2	11.422	2	5.947	2	2.664	2	.854
1	109.43	1	83.35	1	61.96	1	44.47	1	30.39	1	19.43	1	11.354	1	5.905	1	2.641	1	.840
0	109.15	0	83.11	0	61.77	0	44.31	0	30.26	0	19.33	0	11.287	0	5.863	0	2.617	0	.826
9.59	108.87	8.59	82.87	7.59	61.57	6.59	44.15	5.59	30.14	4.59	19.24	3.59	11.221	2.59	5.820	1.59	2.594	0.59	.811
8	108.58	8	82.64	8	61.38	8	43.99	8	30.01	8	19.14	8	11.155	8	5.778	8	2.570	8	.797
7	108.29	7	82.41	7	61.19	7	43.84	7	29.89	7	19.05	7	11.089	7	5.736	7	2.546	7	.783
6	108.01	6	82.18	6	60.99	6	43.69	6	29.76	6	18.96	6	11.022	6	5.695	6	2.522	6	.769
5	107.71	5	81.94	5	60.80	5	43.53	5	29.64	5	18.86	5	10.956	5	5.654	5	2.499	5	.756
9.54	107.44	8.54	81.71	7.54	60.61	6.54	43.37	5.54	29.51	4.54	18.77	3.54	10.891	2.54	5.612	1.54	2.477	0.54	.742
3	107.15	3	81.48	3	60.42	3	43.21	3	29.40	3	18.67	3	10.826	3	5.571	3	2.454	3	.729
2	106.87	2	81.24	2	60.23	2	43.06	2	29.28	2	18.58	2	10.762	2	5.530	2	2.432	2	.715
1	106.59	1	81.01	1	60.04	1	42.91	1	29.16	1	18.49	1	10.698	1	5.489	1	2.409	1	.700
0	106.30	0	80.78	0	59.85	0	42.75	0	29.03	0	18.39	0	10.633	0	5.449	0	2.387	0	.686
9.49	106.02	8.49	80.55	7.49	59.67	6.49	42.60	5.49	28.91	4.49	18.29	3.49	10.569	2.49	5.409	1.49	2.364	0.49	.673
8	105.74	8	80.32	8	59.48	8	42.45	8	28.79	8	18.20	8	10.505	8	5.369	8	2.342	8	.660
7	105.46	7	80.09	7	59.29	7	42.29	7	28.67	7	18.11	7	10.441	7	5.329	7	2.321	7	.646
6	105.18	6	79.86	6	59.10	6	42.14	6	28.55	6	18.02	6	10.378	6	5.290	6	2.299	6	.632
5	104.90	5	79.63	5	58.91	5	41.99	5	28.43	5	17.93	5	10.315	5	5.251	5	2.278	5	.619
9.44	104.62	8.44	79.40	7.44	58.72	6.44	41.84	5.44	28.31	4.44	17.84	3.44	10.253	2.44	5.212	1.44	2.256	0.44	.606
3	104.34	3	79.18	3	58.53	3	41.69	3	28.19	3	17.75	3	10.190	3	5.173	3	2.235	3	.592
2	104.07	2	78.95	2	58.35	2	41.54	2	28.07	2	17.67	2	10.127	2	5.134	2	2.213	2	.578
1	103.79	1	78.72	1	58.17	1	41.39	1	27.95	1	17.58	1	10.065	1	5.095	1	2.192	1	.565
0	103.52	0	78.49	0	57.98	0	41.24	0	27.84	0	17.49	0	10.004	0	5.057	0	2.171	0	.551
9.39	103.24	8.39	78.27	7.39	57.79	6.39	41.09	5.39	27.72	4.39	17.40	3.39	9.943	2.39	5.019	1.39	2.150	0.39	.537
8	102.96	8	78.04	8	57.61	8	40.93	8	27.60	8	17.31	8	9.882	8	4.982	8	2.129	8	.524
7	102.69	7	77.82	7	57.42	7	40.79	7	27.48	7	17.22	7	9.821	7	4.944	7	2.109	7	.510
6	102.42	6	77.59	6	57.24	6	40.64	6	27.36	6	17.14	6	9.760	6	4.906	6	2.089	6	.497
5	102.14	5	77.37	5	57.06	5	40.49	5	27.25	5	17.05	5	9.700	5	4.869	5	2.069	5	.483
9.34	101.86	8.34	77.14	7.34	56.88	6.34	40.34	5.34	27.13	4.34	16.96	3.34	9.640	2.34	4.832	1.34	2.049	0.34	.470
3	101.59	3	76.92	3	56.69	3	40.19	3	27.01	3	16.87	3	9.579	3	4.795	3	2.029	3	.456
2	101.32	2	76.70	2	56.51	2	40.05	2	26.90	2	16.78	2	9.519	2	4.758	2	2.009	2	.443
1	101.05	1	76.48	1	56.32	1	39.90	1	26.79	1	16.70	1	9.460	1	4.722	1	1.989	1	.429
0	100.78	0	76.26	0	56.15	0	39.75	0	26.67	0	16.62	0	9.401	0	4.686	0	1.969	0	.416
9.29	100.51	8.29	76.03	7.29	55.96	6.29	39.61	5.29	26.55	4.29	16.53	3.29	9.342	2.29	4.650	1.29	1.949	0.29	.403
8	100.24	8	75.81	8	55.78	8	39.46	8	26.43	8	16.44	8	9.283	8	4.614	8	1.930	8	.389
7	99.97	7	75.60	7	55.60	7	39.32	7	26.33	7	16.36	7	9.225	7	4.579	7	1.911	7	.375
6	99.70	6	75.37	6	55.42	6	39.17	6	26.21	6	16.27	6	9.167	6	4.543	6	1.891	6	.361
5	99.43	5	75.15	5	55.24	5	39.02	5	26.09	5	16.18	5	9.109	5	4.508	5	1.872	5	.348
9.24	99.17	8.24	74.93	7.24	55.06	6.24	38.88	5.24	25.98	4.24	16.10	3.24	9.051	2.24	4.473	1.24	1.853	0.24	.334
3	98.90	3	74.71	3	54.88	3	38.74	3	25.86	3	16.01	3	8.994	3	4.438	3	1.834	3	.321
2	98.64	2	74.50	2	54.71	2	38.59	2	25.75	2	15.93	2	8.937	2	3.404	2	1.815	2	.307
1	98.37	1	74.28	1	54.53	1	38.44	1	25.64	1	15.85	1	8.880	1	4.370	1	1.796	1	.293
0	98.11	0	74.06	0	54.35	0	38.30	0	25.53	0	15.77	0	8.823	0	4.336	0	1.778	0	.280
9.19	97.84	8.19	73.84	7.19	54.17	6.19	38.16	5.19	25.42	4.19	15.68	3.19	8.766	2.19	4.301	1.19	1.760	0.19	.266
8	97.58	8	73.63	8	54.00	8	38.02	8	25.31	8	15.60	8	8.710	8	4.267	8	1.742	8	.253
7	97.31	7	73.41	7	53.82	7	37.88	7	25.19	7	15.52	7	8.655	7	4.234	7	1.723	7	.239
6	97.05	6	73.20	6	53.64	6	37.73	6	25.08	6	15.44	6	8.599	6	4.201	6	1.705	6	.225
5	96.79	5	72.98	5	53.46	5	37.59	5	24.97	5	15.35	5	8.544	5	4.168	5	1.688	5	.211
9.14	96.53	8.14	72.76	7.14	53.29	6.14	37.45	5.14	24.86	4.14	15.27	3.14	8.488	2.14	4.135	1.14	1.669	0.14	.197
3	96.26	3	72.55	3	53.11	3	37.31	3	24.75	3	15.19	3	8.433	3	4.102	3	1.651	3	.183
2	95.99	2	72.34	2	52.93	2	37.17	2	24.64	2	15.11	2	8.378	2	4.069	2	1.633	2	.169
1	95.73	1	72.13	1	52.76	1	37.03	1	24.53	1	15.03	1	8.324	1	4.037	1	1.616	1	.155
0	95.47	0	71.91	0	52.58	0	36.88	0	24.42	0	14.95	0	8.269	0	4.005	0	1.599	0	.142
9.09	95.21	8.09	71.69	7.09	52.41	6.09	36.74	5.09	24.31	4.09	14.87	3.09	8.215	2.09	3.973	1.09	1.581	0.09	.128
8	94.95	8	71.48	8	52.24	8	36.60	8	24.20	8	14.79	8	8.162	8	3.941	8	1.564	8	.113
7	94.69	7	71.20	7	52.06	7	36.46	7	24.09	7	14.71	7	8.109	7	3.909	7	1.547	7	.099
6	94.44	6	71.06	6	51.89	6	36.32	6	23.99	6	14.63	6	8.056	6	3.877	6	1.529	6	.086
5	94.19	5	70.85	5	51.72	5	36.18	5	23.88	5	14.55	5	8.003	5	3.845	5	1.512	5	.072
9.04	93.93	8.04	70.64	7.04	51.54	6.04	36.04	5.04	23.77	4.04	14.48	3.04	7.950	2.04	3.814	1.04	1.496	0.04	.058
3	93.67	3	70.42	3	51.37	3	35.90	3	23.67	3	14.40	3	7.898	3	3.784	3	1.479	3	.043
2	93.42	2	70.21	2	51.20	2	35.76	2	23.56	2	14.32	2	7.846	2	3.753	2	1.462	2	.028
1	93.16	1	70.01	1	51.03	1	35.63	1	23.46	1	14.24	1	7.794	1	3.723	1	1.445	1	.014
0	92.90	0	69.80	0	50.86	0	35.49	0	23.35	0	14.17	0	7.742	0	3.692	0	1.429	0	.000

* 1.18103Y

(1950)

It may assist workers to have an example worked out for them. Let us assume, therefore, that a color difference is to be worked out according to formula (1) for two yellow samples having the following specifications:

Identification	Munsell Notations			I.C.I. data				
	H	*V*	*C*	*X*	*Y*	*Z*	*x*	*y*
Standard	2.5Y	5.97	3.30	.2940	.2973	.2035	.3698	.3741
No. 2	3.0Y	6.06	3.14	.3028	.3081	.2170	.3658	.3722

Solution: Read values of Y from Table I — V_Y = Std. 5.97, No. 2 6.06
Read values of X from Table II — V_X = Std. 5.99, No. 2 6.07
Read values of Z from Table III — V_Z = Std. 4.71, No. 2 4.84

	Std.	No. 2	Diff.
V_Y =	5.97	6.06	0.09
$V_X - V_Y$ =	+0.02	+0.01	0.01
$V_Z - V_1$ =	−1.26	−1.22	0.04

Substituting in (1):

$$\triangle E_A = 40 \left\{ [0.23\,(.09)]^2 + (.01)^2 + [0.4\,(0.4)]^2 \right\}^{\frac{1}{2}} = 40\,(0.028) = 1.12$$

Use of these tables cuts down enormously the time required for computing color differences. In fact, publication of these tables in convenient form should make it possible for many workers to compute and report results for small color differences for many textile problems where data are needed but are not now computed because of the amount of work required. The "chromatic value" formula for computing small differences is extremely easy to apply when the data are in the form of I.C.I. X, Y, Z for illuminant C, and when Tables I to III are available. As Dr. Godlove has reported, computations for a single color take an average of 90 seconds or less when a number are done at one time.

LITERATURE CITED

(1) Godlove, I. H. Uniformity of Grading of the American, British and German Light-Fastness Standards (Report for AATCC Color Committee). AMER. DYESTUFF REPTR. 39, P215-P221, illus., (April 3, 1950).

(2) Newhall, S. M., Nickerson, D., and Judd, D. B. Final Report of the O. S. A. Subcommittee on the Spacing of the Munsell Colors. *Optical Soc. Amer. Jour.* 30, 617-645, illus., (1943).

(3) Nickerson, D. Summary of Available Information on Small Color Difference Formulas. AMER. DYESTUFF REPTR. 33, P252-P256, illus., (June 5, 1944).

(4) Nickerson, D. Interrelation of Color Specifications. *Paper Trade Jour.* 125, 153-171, illus., (Nov. 6, 1947).

(5) Nickerson, D. and Stultz, K. F. Color Tolerance Specification. *Optical Soc. Amer. Jour.* 34, 550-570, illus. (1944).

(6) Saunderson, J. L. and Milner, B. I. Modified Chromatic Value Space. *Optical Soc. Amer. Jour.* 36, 36-42, illus., (1946).

(7) Vickerstaff, T. and Tough, D. The Quantitative Measurement of Light Fastness. *Jour. Soc. Dyers and Colourists*, 65, 606-612, illus., (Dec. 1949).

ABSTRACTS

Modern Trends in the Use of Detergents

P. B. Law, *Textile J. Australia* 25, 189-92, April, 1950.

A detergent is a substance which facilitates the removal of foreign matter from the surface of a soiled material. On textiles this soil is of two varieties:—(a) oil and grease; (2) solid soil. The removal of these two types of soils calls for ability of the detergent to fulfil five functions:—

(1) Ability to wet the surface being cleansed and the soil thereon.

(2) It must be capable of being absorbed at these interfaces.

(3) It must be capable of emulsifying the oil or greasy soils.

(4) It must be capable of dispersing the solid soil.

(5) It must be capable of maintaining these two types of soil in stable dispersion or emulsion, so that they can be rinsed away without redeposition occurring.

The author elaborates on these five functions, comparing the efficiency of soap with that of several synthetic detergents. He calls particular attention to the value of additions of salt to detergent solutions, to increase their scouring efficiency, and the prevention of redeposition of soil by the addition of carboxymethylcellulose.—W.H.C.

Methods and Reagents Used in Getting the Color Off

A. G. Tyler, *Textile J. Australia* 25, 154-5, 200-3, April, 1950. (from *Dyer and Textile Printer*).

In general, stripping agents for wool should be of an acid nature, while alkaline stripping agents are used with cotton, linen, and the regenerated cellulose rayons. Both acid and alkaline treatments may be used on silk.

Wool. Level-dyeing acid dyes may be partially stripped by boiling in a 30-40 per cent Glauber's salt solution. To destroy the dye by chemical means, strong oxidizing or reducing agents have to be used. For an oxidizing agent, a treatment with bichrome and sulfuric acid is most commonly used. Peroxides are more expensive, but leave the wool in better condition. Acidified permanganate, followed by bisulfite, is still another stripping method. For reducing agents, zinc sulfoxylate formaldehyde is the most widely used. The sodium salt, though more expensive, has the advantage of leaving no insoluble matter in the wool. Titanous chloride and sulfate are also occasionally used.

Cellulosic Fibers. For complete removal of the color, sodium hydrosulfite and caustic soda is the method usually recommended, followed if necessary by a light hypochlorite treatment. The sulfoxylate-formaldehyde compounds and titanous salts are also used at times. Sulfur dyes may be partially stripped by a treatment with sodium sulfide. Chemic also destroys most sulfur dyes. Vat dyes are more difficult to remove. Caustic and hydrosulfite at a high temperature will lighten most shades. Addition of products of the Dispersol VL or Lissolamine V types increases the stripping action. Insoluble azo dyes may be similarly stripped, using an addition of Lissolamine A.

Silk. The usual stripping bath contains hydrosulfite and ammonia. For an acid reducing agent, sodium sulfoxylate formaldehyde is recommended.

Acetate and Nylon. Dispersed dyes are difficult to strip. Hydrosulfite and ammonia will remove some dyes; the addition of Lissolamine will help in some cases.—W.H.C.

Fundamentals of the Crabbing Process

Anon., *Textile J. Australia* 25, 112, 114, April, 1950.

Although machinery has been improved, the basic principle of the crabbing process has remained unchanged for the past 50 years.

Keratin (wool substance) is very sensitive to boiling water, the effect of which is cumulative. Qualitatively, it can be said that the two most important factors controlling setting of the wool fiber by crabbing are the temperature and the pH of the medium. Permanent set is built up by means of two successive chemical reactions—(1) disulfide bond breakdown; (2) the formation of new linkages. At low pH values reaction (1) takes place very slowly and permanent set is, therefore, not realized; when the pH is too high, damage to the wool keratin occurs, partly because reaction (2) does not take place, and partly due to main chain hydrolysis. The pH range which can be used in practice, therefore, lies between 6.0 and 9.5.

As regards the practical problem, the main difficulty faced by the engineer is that of applying heat in the form of steam or water uniformly to a large mass of fabric held under even tension. The other important difficulty in practice is that of ensuring uniformity of pH and electrolyte concentration throughout a piece. This is, of course, particularly the case in crabbing, where the process is carried out prior to any wet treatment.

The author enumerates various serious faults traceable to the crabbing process, and points out that some of these are no doubt due to irregular application of the heat units.—W.H.C.

"Orlon" Acrylic Fiber, Nylon and Fiber V as Effect Threads

Anon., *Technical Bulletin* (Du Pont) 6, 92-109, June, 1950.

Worsted men's wear often contains white or colored "effect threads" which remain untinted when the fabric is piece dyed. Both silk and cellulose acetate have been used for such effects, and recently, it was found that nylon could be resisted to many acid and chrome dyes by treatment with tannic acid, tartar emetic and stannous chloride.

Since Fiber V and "Orlon" continuous filament acrylic fiber exhibit no affinity for acid dyes, they should prove excellent fibers for use as white effect yarns in piece-dyed worsteds. "Orlon" is satisfactory for use in worsteds which are to be piece-dyed with Chromacyl or chrome dyes. Fiber V resists staining by acid colors when these colors are used to cross-dye a nylon-Fiber V combination fabric.

With the increasing popularity of vat-dyed ribbed cotton half-hose, there is definite interest in extending the application of vat dyes to fancy cotton and viscose-process rayon hose containing white and colored illuminating threads or clocks. There is also potential interest in white and colored effects in vat-dyed cotton piece goods for shirtings, curtains, etc. "Orlon", nylon and Fiber V have been evaluated for these purposes.

"Orlon" is not stained significantly when present in cotton which is dyed with vat colors by the "half-hose" procedure. It also withstands staining by many vat dyes applied to cotton piece goods by the pigment pad-jig development technique. "Orlon" also resists staining by direct cotton and dispersed acetate colors.

Dyed nylon yarns resisted with Mordant BS make excellent color effects in cotton fabrics which are vat-dyed by the jig-development procedure. On the other hand, where steam development is employed, the nylon yarns are stained.

Both acetate-dyed and undyed Fiber V yarns are only slightly stained by the six vat dyes applied by the pad-steam process and by the pad-jig process.

The methods for dyeing and cross-dyeing these various fibers are described in great detail.—W.H.C.

The Distribution of Direct Dyes Between Wood and Cotton in One-bath Union Dyeing. Part I—Durazol Red 2B

C. L. Bird, C. M. Nanavati, and C. B. Stevens, *J. Soc. Dyers & Colourists* 66, 281-8, May, 1950.

Note: Durazol Red 2B (C.I. 278) is better known in the United States as Benzo Fast Red 8BL).

Durazol Red 2B shows maximum affinity for cotton at 40°C., but is absorbed more rapidly at higher temperatures; on wool, both the rate of absorption and the amount of dye absorbed increases as the temperature is raised. The effects of adding Glauber's salt to the dyebath, and of varying the liquor-goods ratio, are very similar for both wool and cotton. Addition of small amounts of acid to the dyebath greatly increases the amount of dye absorbed by the wool, but the absorption by cotton is relatively insensitive to pH changes. Provided that acid is not present, the percentage exhaustion of a union dyebath is low, except when the amount of dye available is small.

When only a small amount of dye is used, the color of the two fibers is the same when each contains the same amount of dye. As the percentage of dye on the fiber increases, more dye is required on the cotton than on the wool if the shades on the two fibers are to match. Ultimately, the amount of dye required on the cotton may be four times as much as that required on the wool. The maximum depth of shade obtainable on cotton is much less than that obtainable on wool.

The effects on the absorption of the dye by the two fibers caused by varying the time, pH, addition of Glauber's salt and common salt, and the liquor-goods ratio are illustrated by tables and graphs.—W.H.C.

Some Physical-Chemical Aspects of Cotton Detergency. Limitations of Present Laboratory Testing Methods

J. M. Lambert and H. L. Sanders, *Ind. and Eng. Chem.* 42, 1388-94, July, 1950.

A review of the conventional testing methods has been made which showed that the present tests fail in many respects to simulate adequately actual use conditions. It is pointed out that in practice, cotton is soiled by complex mixtures rather than by large amounts of finely divided carbon black. Moreover, the non-linear relationship between the reflectance and the amount of soil on the fabric indicates that even trace quantities of ingrained soil can reduce appreciably the whiteness of textiles. Also, cotton goods are normally soiled and laundered repeatedly throughout their lifetime in contrast to conventional laboratory wash tests which employ only a single cycle with unused cotton. Preliminary results are described which were obtained with several cotton detergents in multicycle wash tests in which roll towels were soiled in actual use, then washed in a home washing machine and measured in the laboratory. Available field tests made with these detergents essentially substantiated the results of this practical series of tests. Conventional carbon black-type swatches were included in the above washes but in this case the results failed to correlate with the actual performance data. The important distinction between precision and accuracy of laboratory detergency data is illustrated by a typical example.

The limitations of the present laboratory procedures for studying cotton detergency suggest that much greater stress than hitherto should be laid on multicycle tests. Furthermore, the removal of last traces of ingrained soil should be studied by washing to higher reflectance levels.

Fifty-one references to the literature are cited.—W.H.C.

COMPARATIVE RAIN RESISTANCE OF VARIOUS WOOL FABRICS*

ARNOLD M. SOOKNE, FRANCIS W. MINOR and MILTON HARRIS
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Fourteen wool fabrics (a) of widely different structural and physical properties were tested in an artificial three-inch-per-hour rain. The resistance to penetration and absorption of water of these fabrics was determined, and in addition, the effect of a water repellency treatment on these properties was investigated. A number of the structural and physical properties of the fabrics were measured, and the correlation between these properties and rain resistance was examined. The results of the tests in the artificial rain were also compared with the results of laboratory tests for water resistance.

The water repellency treatment improved the resistance to penetration and to absorption of water in every case. The resistance to penetration increased very rapidly with increasing weight and thickness of the wool fabrics. Knitted materials performed relatively poorly when compared with woven fabrics in the same range of weight. No correlation was found between penetration in the rain-room and any of the conventional laboratory tests.

The absorption of water in the rain-room varied directly with the thickness of the fabrics, for both repellent and non-repellent samples. A close relationship was found between the results of laboratory tests of water absorption (modified dynamic absorption test) and absorption of water in the rain-room. The other laboratory tests yielded no correlation with the absorption properties in rainfall of the wool fabrics.

INTRODUCTION

IT is generally recognized that woolen outergarments, especially when they are treated with a water repellent, can provide considerable protection against rainfall. On the other hand, it is equally well agreed that they tend to absorb large quantities of water, and so considerably increase the weight borne by the wearer. This latter property appears to be associated with the porous structure and low density of woolens, which result from inherent characteristics of the wool fiber. Nevertheless, it seems logical that different types of woolen fabrics should behave differently with respect to the absorption of water, and that the resistance to penetration should also be affected by fabric structure. These effects of fabric structure on the water repellency of woolens have apparently never been adequately studied in rainfall. And finally, the magnitude of the improvement in the repellency of different woolen fabrics that can be effected by the application of a water repellent has remained subject to some doubt.

In order to study the effects of fabric properties on the water repellency of wool, a series of wool fabrics varying widely in weight, thickness, and structure was obtained, and their properties studied before and after a water repellency treatment. The structural features of the fabrics were determined, and they were then subjected to a variety of laboratory tests for repellency. The fabrics were then exposed to an artificial three-inch-per-hour rain, and their absorption and resistance to penetration determined as a function of time. The relationships between properties of the fabrics and the results of the laboratory and rain-room tests were then examined. The results of these studies are discussed below.

* This work constitutes a part of the Army Quartermaster program on water resistance of wool for military clothing, and is under the supervision of the National Research Council Advisory Committee on Textile Finishing Research.

(a) The fabrics were supplied by the Philadelphia Quartermaster Depot.

METHODS

1. PREPARATION OF SAMPLES—All of the samples were first subjected to a wool laundering with a detergent of the fatty amide sulfonate type, and with five rinses to effectively remove residual detergent. After drying, they were dry cleaned with freshly distilled Stoddard solvent. Samples treated in this manner are referred to below for convenience as "nonrepellent". Half of each sample was then treated with a solvent-soluble water repellent of the re-treating type. The conditions of treatment were carefully adjusted so that the treated sample bore from 2.0 to 2.25 per cent of water repellent. These samples are referred to below as "repellent".

2. METHODS OF TEST—

A. *Structure*—The thread counts and weights of the fabrics, and the yarn numbers and twists of the yarns were determined by the methods specified by the American Society for Testing Material *(1)*. The thickness at 0.1 lb./in.^{2}, compressibility, and compressional resilience were measured by means of the Schiefer Compressometer. *(6)*. The densities of the fabrics were computed from their weights and thicknesses.

B. *Water Repellency and Resistance to Artificial Rain*—The spray rating, air permeability, and resistance to hydrostatic pressure were determined by the methods described in Federal Specification CCC-T-191a *(3)*. The dynamic absorption method described in that specification was also used, but with the following modification: the increase in weight of the sample after 10, 20, 30 or 60 minutes of tumbling, respectively, was determined, not after a wringing process involving the use of blotters, as prescribed by the standard method, but after free drainage for two minutes. For this purpose the sample was hung vertically, supported from two corners, for two minutes, after which the percent increase in its weight was determined. The wetting times of the samples were determined according to the method of Baxter and Cassie *(2)*.

The measurements in an artificial three-inch-per-hour rain were performed in the rain-room of the Philadelphia Quartermaster Depot *(4)*. The samples were mounted on hemicylindrical forms, and clamped in position over backings of 8.2 oz. cotton twill, which absorbed transmitted moisture. The time intervals over which absorption and resistance to penetration were studied varied from fabric to fabric, depending on the estimated resistance to penetration. Separate specimens and backings were used for each

TABLE I
PHYSICAL PROPERTIES AND STRUCTURE OF FABRICS

	Thread counts ends	Thread counts picks	Weight	Thickness(c)	Density	Compressibility	Compressional resilience
	per inch		oz/yd²	inches	gm/cm³	in./lb/in.	percent
Bunting, untreated	34	36	5.5	0.040	0.183	0.203	44
Bunting, treated(a)	..	..	..	.040	.200	.199	39
9 oz. Tropical Worsted							
untreated	53	48	6.6	.036	.244	.197	35
treated	..	..	..	.040	.231	.207	36
10.5 oz. Flannel							
untreated	74	74	7.8	.047	.221	.211	42
treated	..	..	..	.047	.229	.212	43
13 oz. Felt. Woven							
untreated	..	..	13.5	.113	.153	.193	50
treated	..	..	..	.110	.160	.174	42
13 oz. Tubular Knitted							
untreated	(b)	(b)	16.6	.098	.226	.123	51
treated	..	..	..	.102	.220	.094	44
14 oz. Covert							
untreated	64	64	11.5	.065	.236	.194	56
treated	..	..	..	.063	.250	.161	47
14 oz. Barathea							
untreated	79	91	11.0	.062	.237	.189	44
treated	..	..	..	.065	.239	.161	42
18 oz. Serge							
untreated	66	58	12.4	.046	.358	.149	56
treated	..	..	..	.052	.330	.154	40
18 oz. Elastique							
untreated	120	81	15.5	.075	.274	.127	45
treated	..	..	..	.075	.283	.122	40
20 oz. Flannel							
untreated	50	49	14.8	.081	.245	.160	45
treated	..	..	..	.080	.250	.151	45
20 oz. Melton							
untreated	49	48	14.8	.097	.204	.170	46
treated	..	..	..	.100	.208	.158	40
21.5 oz. Napped							
untreated	30	30	18.4	.165	.148	.203	52
treated	..	..	..	.177	.151	.156	43
26 oz. Knitted							
untreated	..	..	21.0	.156	.179	.151	50
treated	..	..	..	.155	.192	.121	44
32 oz. Melton							
untreated	36	37	25.6	.148	.230	.153	51
treated	..	..	..	.148	.245	.129	45

(a) The treated fabrics bore 2 percent of a solvent-soluble water repellent of the re-treating type.
(b) The tubular knitted fabric had 15 wales and 24 courses per inch.
(c) Thickness was measured at a pressure of 0.1 lb. per square inch.

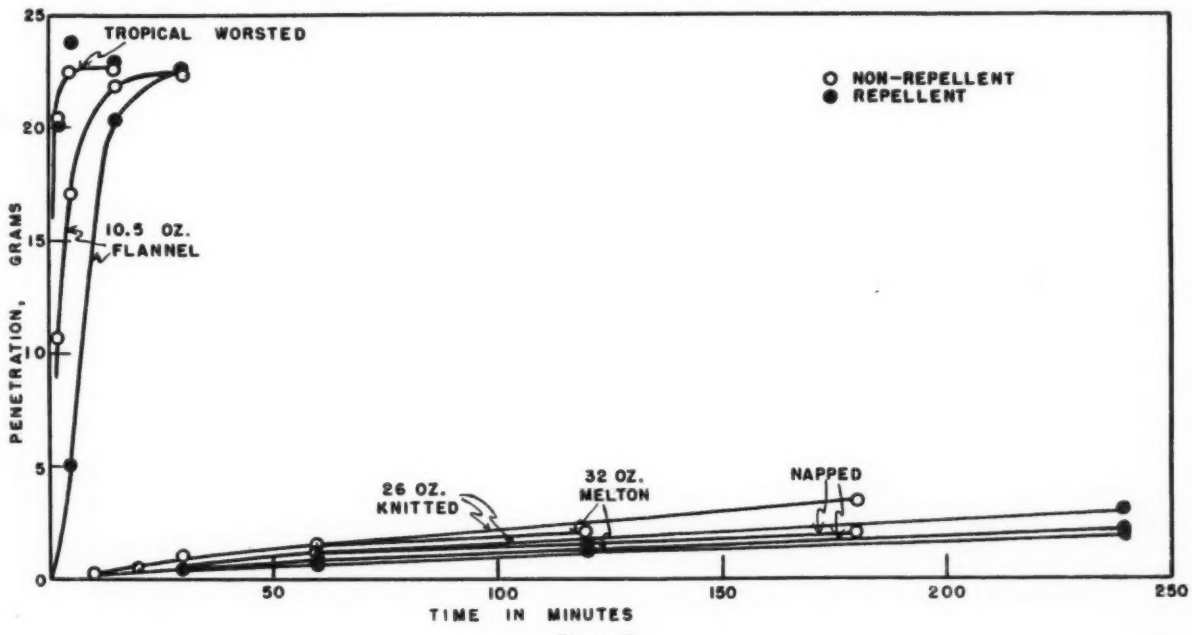

Figure 1

Resistance to penetration in the rain-room of fabrics in groups 1 and 4.

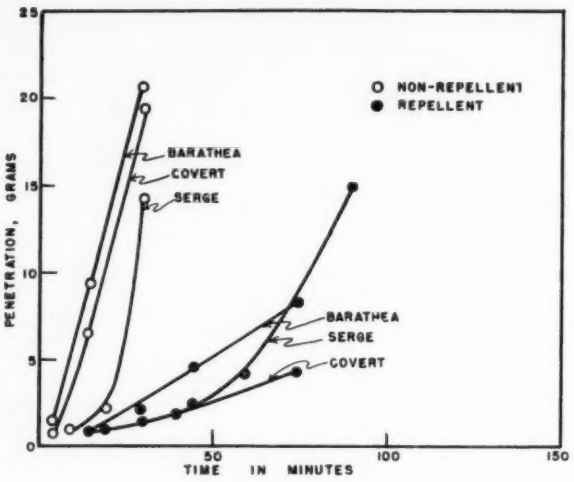

Figure 2

Resistance to penetration of group 2 fabrics in the rain-room.

rics of a very wide range of weights (5.5 to 25.6 oz./yd.^{2}) and thicknesses (0.04 to 0.17 in.) were studied. Thus, the densities varied from 0.15 to 0.36 g./cm.^{3}. These values represent virtually the extremes found in commercial wool fabrics, exclusive of felts.

In order to facilitate comparison, the various fabrics have been divided into four groups, according to weight. These groupings are given in Table IV. A summary of the penetration in the rain-room as a function of time for groups 1 and 4 (lightest and heaviest fabrics, respectively) is given in Figure 1. As shown by these results, the tropical worsted and 10.5 oz. flannel were very rapidly penetrated, although even for these samples, the repellency treatment produced some improvement. (The results of measurements made on a sample of bunting have been omitted, because the specimens were completely penetrated in two minutes,

period of exposure. The increase in weight of the backing (penetration) and of the sample itself (absorption) were determined at the end of each exposure. The samples were hung vertically for two minutes to allow drainage before the increase in weight was measured, so that in this feature the test resembles the modified dynamic absorption method described above. Each result represents the average of at least four determinations. The average temperature of the water during the tests was 14°C.

RESULTS AND DISCUSSION

The results of laboratory measurements of the structural properties and repellency of the wool fabrics are summarized in Tables I, II and III. These tables are provided for reference; the relationships between these results and the rain-room experiments will be described graphically. It should be noted from Table I that fab-

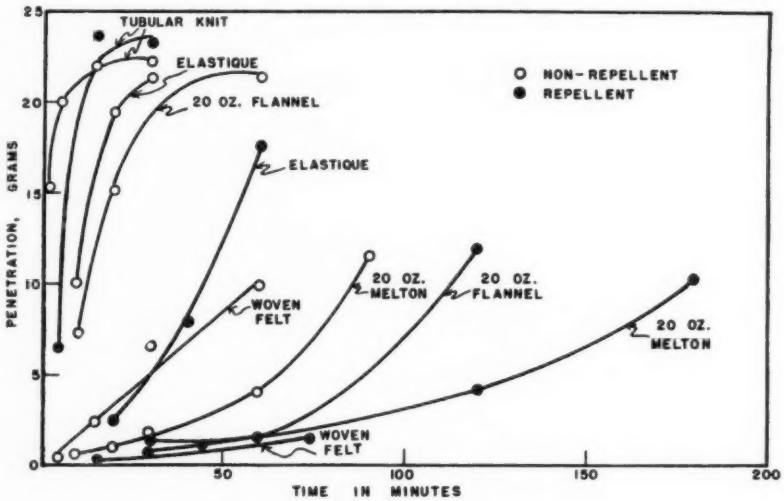

Figure 3

Resistance to penetration in the rain-room of group 3 fabrics.

TABLE II
PROPERTIES OF YARN IN UNTREATED FABRICS

Name of Fabric	*Kind of yarn*	*Yarn number*		*Twists*	
		Filling	*Warp*	*Filling*	*Warp*
		1000 yds/lb.		*turns per inch*	
Bunting	worsted	8	8	13.5	12.2
9 oz. Tropical Worsted	worsted	10	10	12.7	12.2
10.5 oz. Flannel	woolen	13	13	12.6	14.0
13 oz. Felt, Woven	woolen	4	5	6.5	9.7
13 oz. Tubular Knitted	worsted	5(a)		3.6(a)	
14 oz. Covert	worsted	9	9	10.7	13.0
14 oz. Barathea	worsted	12	11	13.8	15.9
18 oz. Serge	worsted	7	7	12.9	11.9
18 oz. Elastique	worsted	12	11	11.6	15.6
20 oz. Flannel	woolen	5	5	8.9	12.1
20 oz. Melton	woolen	4	5	8.0	11.0
21.5 oz. Napped	woolen	1	2	8.5	6.8
26 oz. Knitted	woolen	2(a)		3.7(a)	
32 oz. Melton	woolen	2	2	6.0	6.0

(a) These knitted fabrics contain only one yarn each.

the shortest practicable time interval.). The very heavy samples (napped, knitted and melton) showed no clear evidence of penetration by liquid water even after several hours.* Nevertheless, the curves for the repellent samples (filled circles) fall below those for the nonrepellent specimens in every case. The very slightly inferior performance of the 26-oz. knitted fabric may possibly be ascribed to its knitted construction, which makes for an irregular distribution of fibers and large

* The small increase in weight of the backings observed with these fabrics (see Figure 1) is due to the absorption of water vapor, and in prolonged exposures, a small amount of condensation as well.

TABLE III
RESULTS OF LABORATORY TESTS FOR WATER REPELLENCY OF FABRICS

Name of fabric	Air Permeability ft.³ (min. x ft.²)	Spray rating	Hydrostatic pressure values cm	Dynamic absorption values (b) 10 min. %	20 min. %	30 min. %	60 min. %	Wetting Time Fabric strips secs.	Yarn Filling secs.	Yarn Warp
Bunting, untreated	240	80	7.2	172	179	176	188	71	11	12
treated(a)	215	90	7.2	141	159	163	173	102	19	23
9 oz. Tropical Worsted										
untreated	56	80	12.3	157	162	163	174	99	15	11
treated	49	100	15.1	155	156	164	169	115	20	27
10.5 oz. Flannel										
untreated	39	70	12.2	185	190	194	200	93	10	8
treated	33	90	19.3	170	176	184	178	103	12	9
13 oz. Tubular Knitted										
untreated	158	70	9.4	217	224	226	233	106	22(c)	
treated	147	100	10.5	171	180	187	196	150	32	
13 oz. Felt, Woven										
untreated	56	80	18.2	312	320	317	320	123	47	43
treated	54	100	22.9	264	285	287	301	128	89	82
14 oz. Covert										
untreated	36	80	24.3	187	199	203	210	96	21	17
treated	35	100	24.9	138	160	168	182	126	51	25
14 oz. Barathea										
untreated	33	80	21.0	170	177	183	191	113	14	13
treated	30	100	22.7	138	154	160	167	117	22	30
18 oz. Serge										
untreated	13	80	25.6	131	140	141	147	82	18	12
treated	12	100	30.1	101	110	123	129	127	28	32
18 oz. Elastique										
untreated	43	80	20.2	150	165	177	176	141	17	21
treated	37	90	21.7	124	142	150	167	163	27	25
20 oz. Flannel										
untreated	15	70	9.3	214	215	216	216	91	18	15
treated	15	90	28.2	182	192	196	201	125	37	31
20 oz. Melton										
untreated	41	80	23.4	237	243	245	246	115	41	53
treated	34	90	21.8	209	222	225	229	117	57	64
21.5 oz. Napped										
untreated	91	80	15.2	294	297	295	295	89	58	63
treated	82	90	16.4	264	264	269	266	100	72	73
26 oz. Knitted										
untreated	44	80	19.5	290	294	299	302	104	..	..
treated	42	90	20.7	239	252	258	265	112	..	..
32 oz. Melton										
untreated	20	80	23.9	210	212	213	215	91	38	32
treated	18	90	32.4	157	171	177	185	103	72	68

(a) The treated fabrics bore 2 percent of a solvent-soluble water repellent of the re-treating type.
(b) The excess water in the specimens was removed by hanging them vertically for 2 mins., rather than by squeezing between blotters.
(c) This is a knitted fabric and contains only one yarn.

holes. A longer test or more drastic conditions of measurement are required to differentiate clearly between the resistance to penetration of these heavy fabrics.

Figure 2 shows the resistance to penetration of the fabrics in group 2. The initial penetration of the nonrepellent serge samples occurred later than it did for the barathea or the covert, but once penetration occurred, the serge sample leaked very rapidly. In the repellent state, the serge was excelled by the covert, and for exposures longer than 75 minutes, probably also by the barathea. These data provide somewhat contradictory indications concerning the relative resistance to penetration of a dense fabric like the serge and the considerably lower-density barathea and covert. The somewhat greater weight of the serge may also affect the comparison of the three fabrics. A clearer indication of the effect of density for fabrics of comparable weight is provided by the results for group 3 (Figure 3). As shown by these results, there is a steady improvement in performance with de-

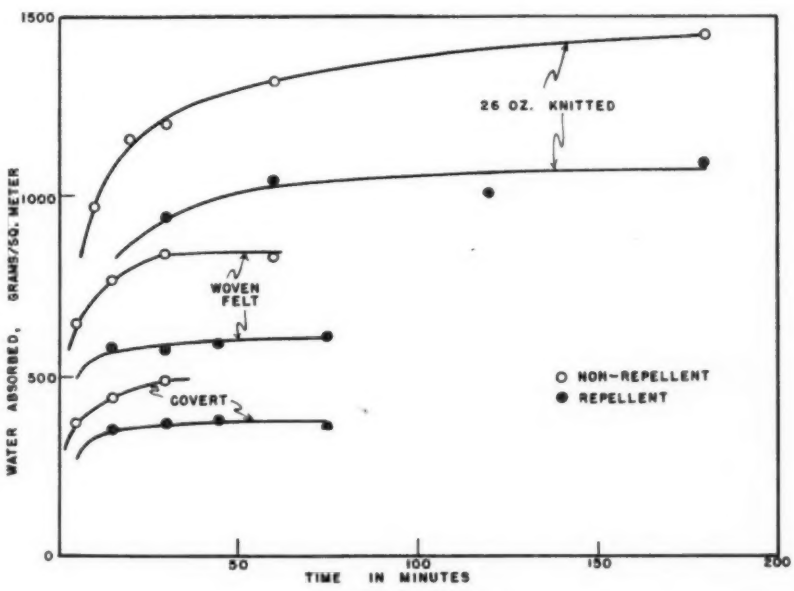

Figure 4

Absorption of water by wool fabrics in the rain-room.

TABLE IV
GROUPINGS OF WOOLEN FABRICS ACCORDING TO WEIGHT

Sample	Weight	Thickness	Density
	oz/yd²	in.	g/cm³
	Group 1		
Tropical Worsted	6.6	0.036	0.244
10.5 oz. Flannel	7.8	.047	.221
	Group 2		
Barathea	11.0	.062	.237
Covert	11.5	.065	.236
Serge	12.4	.046	.358
	Group 3		
Felt, Woven	13.5	.113	.153
20 oz. Melton	14.8	.097	.204
20 oz. Flannel	14.8	.081	.245
Elastique	15.5	.075	.274
Tubular Knitted	16.6	.098	.226
	Group 4		
21.5 oz. Napped	18.4	.165	.148
26 oz. Knitted	21.0	.156	.179
32 oz. Melton	25.6	.148	.230

creasing density (and increasing thickness), except for the tubular knit fabric. The latter performed very poorly in comparison with fabrics of similar weight, presumably because of the large holes in the fabric which result from its knitted construction.

A number of penetration measurements were made on wool fabrics in the laboratory, using the drop-penetration tester *(7)*. These measurements were performed on the serge and napped fabrics, and in sharp distinction to the results obtained in the rain-room, indicated that the serge was highly superior in resistance to penetration. Adjustment of the height of fall of the drops did not alter this relationship, and in view of the good approximation to natural rainfall provided by the rain-room *(4)*, it was concluded that the drop-penetration tester was not a reliable instrument for evaluating the resistance to penetration of wool fabrics. Landsberg *(5)* has shown that there is a good correlation between the results of the drop-penetration tester and the rain-room for cotton flat fabrics. This suggests that the poor correlation obtained with open, porous wool fabrics (like the napped fabric) results from their rapid penetration by the large, high-energy drops of the drop-penetration apparatus. Thus, the latter penetrates the napped fabric in a few minutes, while in the rain-room, this fabric resisted penetration for more than four hours.

Analysis of all of the results of the penetration measurements made in the rain-room leads to the following conclusions: The performance was in every case improved by the water repellency treatment. The resistance to penetration varied very rapidly with the weight and thickness of the fabrics (directly with the sixth power of weight and the fourth power of thickness, approximately). In general, the performance of fabrics of low density was better than that of denser fabrics of equivalent weight. However, the fabrics of lower density were also thicker, and a more critical evaluation of the effect of density would require fabrics varying in density but of equal thickness.

The absorption properties in the rain-room of the various wool fabrics are presented in Table V and graphed for three of the fabrics in Figure 4.* The curves in the latter figure indicate that each fabric tends to approach a limiting value of water absorption in the rain-

TABLE V
ABSORPTION OF WATER BY FABRICS EXPOSED IN RAIN-ROOM

Sample	Nonrepellent		Repellent	
	Duration of exposure	Water Absorbed	Duration of exposure	Water Absorbed
	min.	g/meter²	min.	g/meter²
Bunting	2	240	2	220
Tropical Worsted	2	230	2	180
	5	270	5	240
	15	310	15	260
10.5 oz. Flannel	2	280	5	240
	5	320	15	320
	15	390	30	350
	30	420		
Barathea	5	330	15	310
	15	410	30	370
	30	460	45	360
			75	340
Covert	5	370	15	350
	15	440	30	370
	30	490	45	380
			75	360
Serge	10	320	20	310
	20	360	40	330
	30	390	60	330
			90	330
Felt, Woven	5	650	15	580
	15	770	30	570
	30	840	45	590
	60	830	75	610
20 oz. Melton	10	620	30	670
	20	590	60	680
	30	690	120	750
	60	740	180	730
	90	730		
20 oz. Flannel	10	790	30	500
	20	880	60	520
	30	980	120	580
	60	1020		
Elastique	10	520	20	440
	20	580	40	440
	30	620	60	580
Tubular Knitted	2	580	5	280
	5	760	15	430
	15	920	30	460
	30	1010		
Napped	10	810	30	670
	20	910	60	740
	30	920	120	770
	60	1000	240	760
	180	1080		
26 oz. Knitted	10	970	30	940
	20	1160	60	1040
	30	1200	120	1010
	60	1320	240	1140
	180	1450		
32 oz. Melton	10	840	30	680
	20	960	60	720
	30	1060	120	760
	60	1210	240	760
	120	1220		

* All of the absorption results obtained in the rainroom are expressed in terms of weight of water absorbed per unit area exposed to the rain (grams per square meter). This unit was chosen, rather than the conventional percent absorption, because it leads to simpler interpretation of the results. In addition, the weight of water absorbed per unit area exposed is a quantity of greater practical significance, in terms of the increased weight borne by the wearer of a garment.

room, and it will be shown below that this maximum is considerably lower than the maximum water-holding capacity as determined by the modified dynamic absorption test. In addition, examination of the data in Table V and Figure 4 shows that in every case the water repellency treatment considerably reduced the amount of water absorbed. For both the repellent and nonrepellent specimens, the maximum weight of water absorbed in the rain-room varied directly with the thickness of the samples (Figure 5). As shown by Figure 6, this was also true of the results obtained in the modified dynamic absorption test. In general, the maximum water absorption in both the rain-room and the dynamic absorption test varied inversely with the density, but the results did not fall on a good straight line. Under the conditions that exist in the rain-room, distinctly separate curves relating thickness and absorption are obtained for the nonrepellent and repellent samples (Figure 5), while under the drastic conditions of the dynamic absorption test this difference is minimized, although, as will be seen from Table III, it remains significant. As a consequence, the relationship between the rain-room and dynamic absorptions is slightly different for the repellent and nonrepellent samples (Figure 7). For both sets of samples, the modified dynamic absorption test gave higher absorption values than did the rain-room.

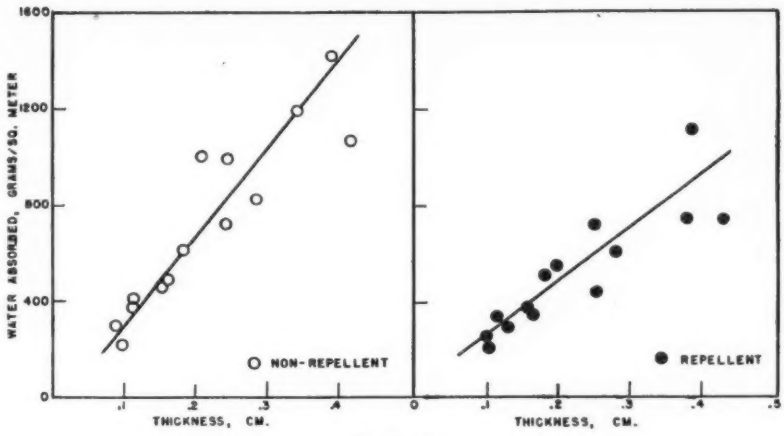

Figure 5

Maximum absorption of water in the rain-room as a function of thickness of wool fabrics.

CONCLUSIONS

The results described above indicate the need for further experiments to establish clearly certain aspects of the effect of fabric structure on the repellency of woolens. However, a number of significant conclusions can be drawn from the present data. These are enumerated below.

EFFECT OF STRUCTURE ON PENETRATION—

1. The resistance to penetration of the wool fabrics varied markedly with their weight and thickness. Thus, the resistance to penetration was proportional to approximately the fourth power of the thickness and the sixth power of the weight. While an improvement in performance with increasing weight or thickness was certainly to have been expected, the remarkable sensitivity of resistance to penetration to these properties could hardly have been predicted.

2. Samples with knitted structures gave relatively poor resistance to penetration, presumably because of the relatively large holes in such fabrics. Conversely, the woven felt sample, which apparently has a very even distribution of fibers, gave unusually good performance for its weight.

3. The repellent samples of the heavier fabrics (blanket and heavy melton) showed no signs of penetration even after four hours of exposure to the three-inch-per-hour rain. It would be desirable to perform tests in rainfall of garments made of these materials, in order to learn whether more drastic laboratory tests are required to evaluate such fabrics.

4. No correlation was observed between resistance to penetration and the air permeability, spray rating, modified dynamic absorption, resistance to hydrostatic pressure, or wetting time of the samples.

EFFECT OF FABRIC PROPERTIES ON ABSORPTION OF WATER—

1. The maximum weight of water absorbed in the rain-room varied directly with the thickness of the samples, and approximately inversely with their densities.

2. There was a good relationship between the maximum absorption in the rain-room and in the modified dynamic absorption test. This laboratory test therefore appears to be useful for estimating the absorption of water by woolens in the rain.

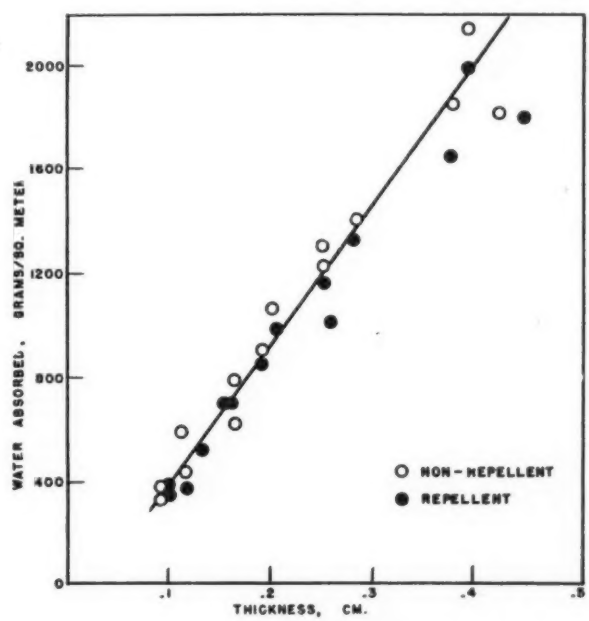

Figure 6

Maximum absorption of water in the dynamic absorption test as a function of thickness of wool fabrics.

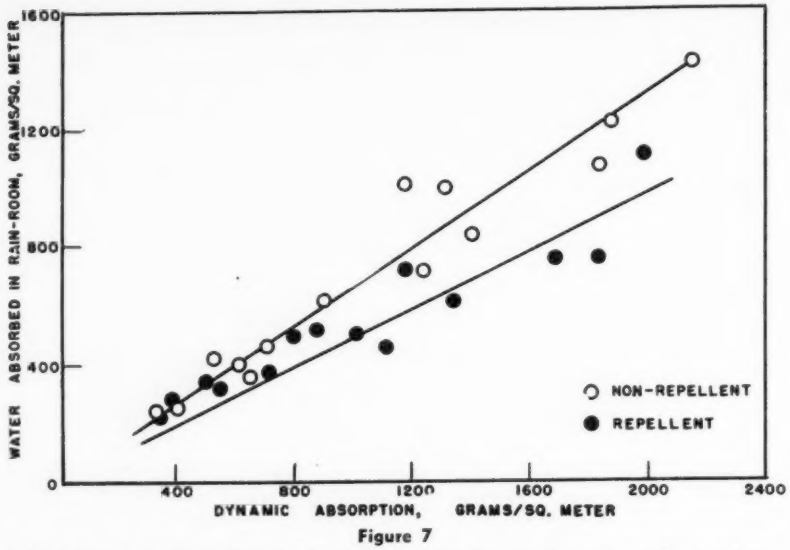

Figure 7

Relation between maximum absorption in rain-room and in dynamic absorption test for wool fabrics.

3. The absorption in the rain-room approached a limiting value after long exposure. This limiting value was well below the maximum absorption obtained with the modified dynamic absorption test. Thus, under rain-room conditions, unsaturated regions remained in the fabrics, even after long exposure.

4. Even in the repellent condition, the least absorptive wool fabric tested absorbed about 80 percent of its own weight of water after long exposure to rainfall.

5. There was no correlation between absorption of water in the rain-room and the spray rating, resistance to hydrostatic pressure, or wetting time of the samples.

GENERAL CONCLUSIONS—

1. Without exception, samples treated with water repellent absorbed less water and gave better resistance to penetration in an artificial three-inch-per-hour rain than did the respective untreated fabrics.

2. Those fabric properties which favor good resistance to penetration (high weight and thickness) unfortunately also favor the absorption of large quantities of water. Thus, it appears that the production of wool fabrics which perform well with respect to both penetration and absorption will require development of highly superior water repellents.

REFERENCES

1. A.S.T.M. Standards on Textile Materials, American Society for Testing Materials, October 1948, Philadelphia.

2. Baxter, S., and Cassie, A.B.D., *J. Textile Institute* 36, T67-90 (1945).

3. Federal Specification CCC-T-191a Supplement, October 8, 1945.

4. Landsberg, M. I. and Moody, F. J., *Textile Research J.* 16, 211-18 (1946).

5. Landsberg, M. I., Kelly, R. and Sinski, D., *Textile Research J.* 19, 505-16 (1949).

6. Schiefer, H. F., *J. Research Nat'l Bur. Standards* 10, 705-13 (1933).

7. Sookne, A. M., Minor, F. W., Simpson, J. E., and Harris, M., *Am. Dyestuff Reptr.* 35, 295-8 307-8 (1946).

INDEX TO PATENT DIGEST

FOLLOWING is an index, by subject and patent number, of the patent abstracts that have appeared in these pages from July, 1949 to June, 1950. The number in parentheses, followed by the page number, refers to the year in which the abstract appears.

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U. S. Pat. 2,457,853 (National Lead Company) 521 (1949)
U. S. Pat. 2,464,192 (Am. Cyanamid) 659 (1949)
U. S. Pat. 2,466,066 (Heberlein Pat. Corp.) 563 (1949)
U. S. Pat. 2,466,348 (L. O. Nichols) 584 (1949)
U. S. Pat. 2,466,457 (Am. Cyanamid) 563 (1949)
U. S. Pat. 2,466,656 (Am. Cyanamid) 522 (1949)
U. S. Pat. 2,466,695 (Harris Research Labor.) 522 (1949)
U. S. Pat. 2,468,207 (Corn Prod. Ref. Co.) 659 (1949)
U. S. Pat. 2,468,940 (Du Pont) 563 (1949)
U. S. Pat. 2,469,249 (Mathieson Chem. Corp.) 660 (1949)
U. S. Pat. 2,469,431 (Carbide and Carbon) 564 (1949)
U. S. Pat. 2,470,453 (Wolsey Ltd.) 585 (1949)
U. S. Pat. 2,471,456 (Montclair Res. Corp.) 738 (1949)
U. S. Pat. 2,472,052 (Am. Cyanamid) 765 (1949)
U. S. Fat. 2,472,590 (Eastman Kodak) 802 (1949)
U. S. Pat. 2,473,473 (Eastman Kodak) 802 (1949)
U. S. Pat. 2,473,308 (Röhm & Haas) 659 (1949)
U. S. Pat. 2,473,473 ((See U. S. Pat. 2,472,590
U. S. Pat. 2,474,502 (Ch. T. Suchy) 756 (1949)
U. S. Pat. 2,474,785 (Am. Cyanamid) 738 (1949)
U. S. Pat. 2,474,890 (Celanese) 756 (1949)
U. S. Pat. 2,474,909 (Celanese) 756 (1949)
U. S. Pat. 2,475,672 (Celanese) 765 (1949)
U. S. Pat. 2,476,069 (Wingfoot Corp.) 738 (1949)
U. S. Pat. 2,476,287 (Celanese) 802 (1949)
U. S. Pat. 2,478,974 (Celanese) 956 (1949)
U. S. Pat. 2,479,303 (Am. Cyanamid) 766 (1949)
U. S. Pat. 2,480,775 (Du Pont) 802 (1949)
U. S. Pat. 2,481,205 (Mathieson Chem. Corp.) 957 (1949)
U. S. Pat. 2,481,992 (Fisher) 100 (1950)
U. S. Pat. 2,482,042 (Montclair Research) 955 (1949)
U. S. Pat. 2,482,319 (Marcel Cassé) 955 (1949)
U. S. Pat. 2,482,470 (Am. Cyanamid) 956 (1949)
U. S. Pat. 2,482,497 (Un. Merch. & Manuf., Inc.) 96 (1950)
U. S. Pat. 2,482,578 (Arthur D. Little) 97 (1950)
U. S. Pat. 2,482,816 (National Lead Company) 957 (1949)
U. S. Pat. 2,483,493 (Hutten) 191 (1950)
U. S. Pat. 2,484,545 (Alrose Chem. Corp.) 97 (1950)
U. S. Pat. 2,484,598 (Alrose Chemical Corp.) 97 (1950)
U. S. Pat. 2,484,599 (Alrose Chem. Co.) 98 (1950)
U. S. Pat. 2,484,962 (Montclair Res.) 98 (1950)
U. S. Pat. 2,485,603 (Du Pont) 98 (1950)
U. S. Pat. 2,485,250 (Wolsey Lim.) 190 (1950)
U. S. Pat. 2,486,399 (Dan River Mills) 99 (1950)
U. S. Pat. 2,487,197 (Du Pont) 191 (1950)
U. S. Pat. 2,488,397 (Jos. Bancroft & Sons) 201 (1950)
U. S. Pat. 2,488,544 (Sherwin Williams Co.) 99 (1950)
U. S. Pat. 2,488,650 (Commercial Solvents) 192 (1950)
U. S. Pat. 2,489,473 (Sun Chemical Corp.) 192 (1950)
U. S. Pat. 2,489,537 (Neumann-Arpin) 201 (1950)
U. S. Pat. 2,491,249 (Am. Cyanamid) 267 (1950)
U. S. Pat. 2,491,454 (Am. Cyanamid) 202 (1950)
U. S. Pat. 2,492,574 (Heintzelman-Malick) 267 (1950)
U. S. Pat. 2,492,974 (Dungler) 268 (1950)
U. S. Pat. 2,493,360 (Sun Chemical Corp.) 336 (1950)
U. S. Pat. 2,493,381 (U. S. Finishing Co.) 287 (1950)
U. S. Pat. 2,493,765 (Le Compte) 288 (1950)
U. S. Pat. 2,494,731 (Mathieson Chem. Co.) 288 (1950)
U. S. Pat. 2,494,810 (Geigy A.G.) 336 (1950)
U. S. Pat. 2,495,810 (Celanese) 289 (1950)
U. S. Pat. 2,496,631 (Nopco Chem. Co.) 336 (1950)
U. S. Pat. 2,497,017 (Pacific Mills) 289 (1950)
U. S. Pat. 2,497,519 (Alrose Chem. Co.) 337 (1950)
U. S. Pat. 2,498,408 (Gen. Aniline & Film) 391 (1950)
U. S. Pat. 2,498,416 (Parks & Woolson Mach. Co.) 301 (1950)
U. S. Pat. 2,498,454 (Ciba) 337 (1950)
U. S. Pat. 2,499,141 (Fair Lawn Finishing Co.) 390 (1950)
U. S. Pat. 2,499,787 (Du Pont) 389 (1950)
Brit. Pat. 600,751 (Standard Bleachery & Printing Co.) 584 (1949)
Brit. Pat. 603,154 (Durand & Huguenin) 564 (1949)
Brit. Pat. 604,696 (Bleacher's Assoc.) 583 (1949)
Brit. Pat. 606,896 (S.A. Francolor) 564 (1949)
Brit. Pat. 609,257 (Tootal Broadhurst Lee) 522 (1949)
Brit. Pat. 611,166 (Deck) 583 (1949)
Brit. Pat. 628,882 (Ciba Ltd.) 190 (1950)
Brit. Pat. 629,329 (Wolsey Ltd.) 190 (1950)
Brit. Pat. 630,172 (Bleacher's Assoc'n) 335 (1950)
Brit. Pat. 631,765 (Gen. Aniline & Film) 388 (1950)
Brit. Pat. 631,907 (Unit. Turkey Red Company) 389 (1950)
Brit. Pat. 633,160 (Imp. Chem. Ind.) 389 (1950)
Brit. Pat. 633,602 (Imp. Chem. Ind.) 389 (1950)
Brit. Pat. 633,441 (Imp. Chem. Ind.) 390 (1950)
Brit. Pat. 633,602 (Imp. Chem. Ind.) see Brit. Pat. 633,160

SUBJECT INDEX

ACRYLONITRILE SOLUTION—Reacted on alkali prepared fibers (U. S. Pat. 2,473,308)....659 (1949)
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CREASEPROOFING TEXTILES—Water-soluble precondensates followed by acid steam (U. S. Pat. 2,484,598)....97 (1950)
CREASE RESISTANCE—Testing method and apparatus (U. S. Pat. 2,479,303)....766 (1949)
CREASE RESISTANCE—Testing method and apparatus (U. S. Pat. 2,482,470)....956 (1949)
DECATING MACHINE—(U. S. Pat. 2,498,416)....301 (1950)
DELUSTERING—Finely dispersed titanium dioxide (U. S. Pat. 2,464,192)....659 (1949)
DELUSTERING NYLON—Antimony compounds used (Brit. P. 609,257)....522 (1949)
DRYING FABRICS—Hot air blown through slits in different directions (U. S. Pat. 2,492,974)....268 (1950)
DYEING APPARATUS—Continuous treatment of fabrics, rolled in double ply (U. S. Pat. 2,481,992)....100 (1950)
DYEING APPARATUS—For vat dyes—Reduction by electric current (Brit. P. 600,751)....584 (1949)
DYEING APPARATUS—With improved means for dyebath circulation (U. S. Pat. 2,482,319)....955 (1949)
DYEING CELLULOSE ACETATE (or nylon)—With insoluble azo dyes (Brit. P. 606,896)....564 (1949)
DYEING CELLULOSE ACETATE—With leuco vat dyes (U. S. Pat. 2,476,287)....802 (1949)
DYEING CELLULOSE ACETATE—With solvent solutions of dyes—alkalis added (U. S. Pat. 2,495,810)....289 (1950)
DYEING NYLON—Using dilute acid dye solutions (U. S. Pat. 2,499,787)....389 (1950)
DYEING NYLON—Vinyon or acetate of cellulose with mordant dyes—iron carbonyl preparation (Brit. P. 631,765)....388 (1950)
DYEING NYLON—With insoluble acetate dyes—mono—and multifilaments combined (U. S. Pat. 2,480,775)....802 (1949)
DYEING NYLON—With insoluble acetate dyes—steam after-treatment (U. S. Pat. 2,474,890)....756 (1949)
DYEING NYLON—With vat dyes or indigosols—improving fastness to light (Brit. P. 603,154)....564 (1949)
DYEING VINYLCHLORIDE FIBERS—Basic dyes used (U. S. Pat. 2,489,537)....201 (1950)
FINISHING ROLL FOR TEXTILES—Brushing device (U. S. Pat. 2,466,348)....584 (1949)
FLAMEPROOFING — Polyethylenecimine composition (Brit. P. 633,441)....390 (1950)
DELUSTERING—Vinylidene—vinyl-polymers (U. S. Pat. 2,476,069)....738 (1949)
LUBRICATING WOOL—Composition of amides, esters and a non-resinifying oil (U. S. Pat. 2,496,631)....336 (1950)
METALLIZATION of non-conductive material, fabrics, paper, etc. (U. S. Pat. 2,474,502)....756 (1949)
OILED SILK FINISH—Two step process (U. S. Pat. 2,478,974)....956 (1949)
"ONIUM"—Compounds of various dyestuff groups for new printing effects (Brit. P. 633,160 and Brit. P. 633,602)....389 (1950)
PERMANENT FINISHES—Cellulose ethers (or polyvinylalcohols) combined with amino resins (U. S. Pat. 2,469,431)....564 (1949)
PIGMENT DYEING—Alginates, added to oil-in-water dispersions (U. S. Pat. 2,488,544)....99 (1950)
PIGMENT PRINTING—Condensates of substituted guanidines with aldehydes (U. S. Pat. 2,474,909)....756 (1949)
PIGMENT PRINTING—Oil-in-water emulsions—caseinates in the aqueous phase (Brit. P. 628,882)....190 (1950)
PIGMENT PRINTING—Oil-in-water emulsions—caseinates in the aqueous phase (U. S. Pat. 2,498,454)....337 (1950)
PIGMENT PRINTING—Oil-in-water emulsions, containing the pigment in the aqueous phase (U. S. Pat. 2,494,810)....336 (1950)
PRINTING INDIGOSOLS—Adding alkyl aromatic sulfonates (U. S. Pat. 2,466,656)....522 (1949)
PRINTING INDIGOSOLS—Adding alkyl—or alkylene aniline sulfonic acid salts (U. S. Pat. 2,474,785)....738 (1949)
PRINTING THICKENER—Colloidal Clay (Bentonite) exclusively used (Brit. P. 631,907)....389 (1950)
PRINTING VAT DYESTUFFS—By fixation with actinic rays (Brit. P. 604,696)....583 (1949)
SAMPLE CUTTER—For textile fiber goods (U. S. Pat. 2,483,493)....191 (1950)
SCOURING AND BLEACHING WOOL—In the same operation—sodiumchlorite added (U. S. Pat. 2,481,205)....957 (1949)
SCOURING CAUSTIC IMFREGNATED CELLULOSIC TEXTILES—Steam aftertreatment (U. S. Pat. 2,469,249)....660 (1949)
SETTING NYLON (or similar fabrics)—Treatment with hot gases (U. S. Pat. 2,499,141)....390 (1950)
SHRINKPROOFING TEXTILES—Alkylated methylolmelamines combined with nitrogen bases (U. S. Pat. 2,466,457)....563 (1949)
SHRINKPROOFING WOOL—Butadiene or derivatives, co-polymerized with acrylonitril (U. S. Pat. 2,484,962)....98 (1950)
SHRINKPROOFING WOOL—Chloroprene polymers used (U. S. Pat. 2,471,456)....738 (1949)
SHRINKPROOFING WOOL—Concentrated amines (U. S. Pat. 2,493,765)....288 (1950)
SHRINKPROOFING WOOL—Hypochlorite in concentrated solutions (U. S. Pat. 2,466,695)....522 (1949)
SHRINKPROOFING WOOL—Maleic anhydride co-polymerized with acrylic acid ester (U. S. Pat. 2,499,653)....338 (1950)
SHRINKPROOFING WOOL — Organosilicon compounds used (Brit. P. 629,329)....190 (1950)
SHRINKPROOFING WOOL—Sonic or ultrasonic waves (U. S. Pat. 2,470,453)....585 (1949)
SHRINKPROOFING WOOL—Watersoluble precondensates; after-treating with acids in two curing steps (U. S. Pat. 2,485,250)....190 (1950)
SHRINKPROOFING WOOL—Watersoluble precondensates, followed by acid steam (U. S. Pat. 2,484,599)....98 (1950)
SLIPPROOFING TEXTILES—Alkylated methylolmelamines in aqueous solutions (U. S. Pat. 2,491,454)....202 (1950)
STABILIZING CELLULOSIC TEXTILES—(Shrinkproofing)—Glyoxal plus salts of oxydizing agents (U. S. Pat. 2,484,545)....97 (1950)
STABILIZING CELLULOSIC TEXTILES — Ketone-Aldehyde-Starch condensates used (U. S. Pat. 2,486,399)....99 (1950)
STABILIZING RAYON FABRICS—Short immersion in strong caustic solution (U. S. Pat. 2,497,519)....337 (1950)
STARCH SIZES—Alkalistannate added (U. S. Pat. 2,468,207)....659 (1949)
STARCH SOLUTIONS—Treatment with nitrogenoxides—see CELLULOSE AND STARCH SOLUTIONS
STATIC ELECTRICITY PREVENTION—Dialkyphosphates (U. S. Pat. 2,498,408)....301 (1950)
STEAMING APPARATUS—For pretreating raw textiles (U. S. Pat. 2,494,731)....288 (1950)
SULFUR DYE PREPARATIONS—Printing pastes, containing alkylolamines (U. S. Pat. 2,472,052)....765 (1949)
TENTER—FRAME—Clips and pins for alternating use (Brit. P. 611,166)....583 (1949)
TRANSPARENTIZING—Resists obtained by preprinting isocyanates or "Velan" compounds (Brit. P. 630,172)....335 (1950)
VAT DYEING—Pad steam process and apparatus (U. S. Pat. 2,487,197)....191 (1950)
WATER REPELLENT FABRICS—Alkylsilicon thiocyanates used (U. S. Pat. 2,485,603)....98 (1950)
WATER REPELLENT FABRICS—Condensates of higher nitrils and formaldehyde (U. S. Pat. 2,493,360)....336 (1950)
WATER REPELLENT FABRICS — Esters of nitro alcohols (U. S. Pat. 2,488,650)....192 (1950)
WATER REPELLENT FABRICS—Quaternary compounds derived from higher imides (U. S. Pat. 2,489,473)....192 (1950)
WATER REPELLENT FABRICS—Zirconium compounds, decomposed at elevated temperatures (U. S. Pat. 2,457,853)....521 (1949)
WATER REPELLENT FABRICS—Zirconium salts in state of "co-ordination" (U. S. Pat. 2,482,876)....957 (1949)

OBITUARY

THOMAS FREDERICK GORTON, sales manager for textile auxiliary products, Geigy Company, Ltd., Manchester, England, died on June 9th at the age of 56.

Mr. Gorton was born in Chorlton-cum-Hardy where he spent the greater part of his youth and was educated at Manchester Grammar School and the Royal Technical College, Salford. Following his schooling he joined R. P. Lawson Sons, Ltd., yarn dyers and mercerizers of Manchester, where he was employed both in the laboratory and plant. In 1920 he went with Norman Evans and Rais, Ltd. of Manchester, chemical manufacturers and agents for Kalle, serving as technical sales representative in the Leicester district. He joined the Geigy organization in 1931. While with them he covered the United Kingdom and made many trips abroad.

During his youth he was well known in Lancashire lacrosse circles serving as a player and secretary of Chorlton-cum-Hardy Lacrosse Club. He had a pleasing tenor voice and took an active part in many amateur dramatic productions. During later years he became interested in golf and last year he was elected to the captaincy of Chapel-en-le-Frith Golf Club. He visited the United States on two occasions and left behind him not only a great respect for his ability but many true friends.

The *Dyer & Textile Printer* (England) commented on his passing as follows:

"Tom Gorton's chief characteristics were twofold. He had an amazing capacity for making friends regardless of nationality (it has been truly said that he made many friends and never lost one) and an infectious enthusiasm for any cause which he deemed right; with the latter was associated a fine old-fashioned scorn of anything which he considered to be shabby or underhand."

FELT DYEING AND PROCESSING*

B. KRAMRISCH

BEFORE dealing with certain aspects of felt dyeing and processing, it is of interest to make some reference to the factors which determine felting and to the theories which have been put forward to account for the behavior of animal fibers during the felting operation.

This subject has been studied in detail by Speakman and his colleagues at Leeds University, and by Martin and other workers at the Wool Industries Research Association. Problems directly connected with the hatting industry are now being investigated at the British Hat and Allied Feltmakers' Research Association.

A critical review of the nature of felting has been made by Freney *(1)*. A widely accepted view involves a directional frictional effect (D.F.E.); i.e., it postulates that when animal fibers are subjected to frictional forces, as in milling, they always travel in one direction, viz. towards the root end of the fiber. This behavior has been shown to be due to the characteristic manner in which scales are placed on the surface of the fiber *(2)*.

Felting properties of animal fibers are in general governed by the following factors—

(1) Characteristic surface scale structure.
(2) Ease of deformation under load.
(3) Extent of recovery from deformation.

Felting is influenced by—

pH and temperature of the milling liquor.
Type of mechanical treatment.
Duration of treatment.

As far as the actual fibers are concerned the following factors are to be taken into consideration—

Moisture content
Compressibility
Porosity
Ability to take a permanent set
Scaliness
Length
Curl and twist
Orientation in the material.

For practical purposes the felt industry can be divided into two main sections, one dealing with continuous or flat felts and the other with hoods.

* Paper presented at meeting, London Section, Society of Dyers and Colourists, April 8, 1949. Reprinted from their *Journal*, January, 1950.

CONTINUOUS (FLAT) FELTS

The bulk of continuous felts are made from wool noils or other fibers in the loose state, which are blended and carded to produce a loose web, which is then transformed into felt by *forming* followed by acid milling in stocks or on roller milling machines. They are also woven from yarn and then felted by milling under acid or alkaline conditions (e.g., for papermakers' felts).

Felts may be made from wool or a mixture of wool and hair such as cowhair, while cheaper felts contain varying proportions of cotton or other cellulosic materials. Casein fibers and other protein fibers may also be used in admixture with the foregoing.

Felts cover a wide range of uses, and include floor coverings, baizes, saddle cloths, lagging and insulating materials for industrial and domestic purposes, felt slippers, and "clothing" for drying cylinders.

The fastness requirements of dyed felts are usually not high, reasonably good fastness to light and water normally being the main essentials. Level-dyeing acid dyes are employed for wool and hair felts, and direct dyes or combinations of the latter with neutral-dyeing acid dyes when cellulosic fibers are present.

Dyeing is carried out on the winch, and felts even up to 1 in. thick and weighing 8-10 lb./yd. can be penetrated. The use of suitable auxiliaries, such as Invadine NBN and Claysol WO, assists penetration.

Felts often contain vegetable impurities, which are removed by carbonization with sulfuric acid. If this is carried out after dyeing, changes in hue may result unless suitable dyes are selected. For example, Kiton Fast Red 2BLE is faster to this treatment than Kiton Red G and similar products.

The dyeing of carbonized felts can give rise to difficulties as regards levelling and penetration owing to residual sulfuric acid, which may be of the order of 8-9%, and it is usual to begin dyeing with Glauber's salt and selected level-dyeing acid dyes. Recent work has shown that the number of sulpho groups present in acid dyes affects the results obtained on carbonized materials *(3)*.

Alternatively, the carbonized material may be neutralized with ammonia or sodium acetate, but this is difficult to control in bulk. Neolan dyes, on the other hand, dye carbonized pieces without prior neutralization and cover up carbonizing faults readily. Our investigations have shown that all piece-dyeing Neolan dyes are equally suitable, irrespective of the number of sulfo groups present in the dye molecule.

Felt mats are often decorated by stencil printing with acid direct, and other types of dyes.

Proofing against vermin can be carried out with such products as dinitro-a-naphthol or cuprammonium, and mothproofing with suitable proprietary compounds.

HAT FELTS

Wool noils are used for felts of cheaper quality, and rabbit or hare fur for the better qualities. Mixtures of wool and fur are also used.

In the manufacture of wool felts, the scoured and carbonized noils are opened and carded, and the lap so formed is wound on a revolving cone to give a *form* which is *settled* by soaking in acidulated water and passing through fluted rollers and then *planked* (acid-milled) in stocks.

For fur felts, the fur has first to be *carrotted* to improve its felting properties. Usually a mixture of an oxidizing agent, an acid hydrolyzing agent and sometimes a metallic catalyst is used. Mercuric nitrate and nitric acid are commonly used in this country. Speakman has recommended hardening the fibers with mercuric acetate and then softening the tips of the fibers with mercuric nitrate, which is stated to result in more rapid felting. The mercuric carrott is prohibited in Germany on the score of danger of mercurial poisoning, and two mercury-free carrotts are made by Degussa A.-G. of Frankfort, both consisting of two solutions—

(1) AUROFELT—
  (*a*) Hydrogen peroxide, phosphoric acid, and sodium pyrophosphate
  (*b*) Ferric nitrate and nitric acid
(2) ARGYROFELT—
  (*a*) Hydrogen peroxide, phosphoric acid, and sodium pyrophosphate
  (*b*) Nitric acid, ferrous sulfate, and phosphoric acid.

The latter mixture is said to give a snow-white carrott *(4)*. There are numerous American patents on this subject.

TABLE I
DYE TAKEN UP BY FELT
%

Felt	Depth (%)	Kiton Fast Yellow 2G	Tartrazine	Kiton Red G	Kiton Red 6B	Alizarine Sapphire Blue CB
C.I. No.	—	639	640	31	57	1054
Wool	1.0	60	63	75	68	68
Fur	1.0	54	51	59	46	43
Wool	3.0	56	58	55	56	54
Fur	3.0	44	41	47	45	47

The carrotted fur is opened, *blown* to remove impurities, blended, made into a *form* by drawing over a perforated cone, hardened, *settled*, and *planked* or *bumped* by milling with sulfuric acid.

DYEING

For mixture hats, the fur or wool is dyed in the loose condition in open pans or circulating machines using dyes fast to acid milling from the aggregated (Cloth Fast), Acid Alizarin, or chrome ranges. The last type of dye, however, is not universally applicable, as the chrome taken up by the fiber may interfere with subsequent felting operations.

Hoods are dyed in the partly or fully planked condition in the following types of machines—

(1) PADDLE—Acid dyes are employed, and there is always the danger of producing crease marks or "crow's feet" by this method of dyeing.

(2) ROTARY DRUM—This type of machine consists of a perforated drum divided into four compartments and rotating in a rectangular box which can be heated. Temperatures of 85-90°C. are generally not exceeded, and the dyeing of both wool and fur felt hoods is confined to level-dyeing acid dyes. Somewhat higher temperatures are obtainable, however, by enclosing the machine. Similar trouble with crease marks is encountered as with the paddle machine.

(3) CASSE and OBERMAIER MACHINES consist of a circular container in which the dye liquor is agitated by a swirling motion, temperatures of about 95°C. being obtainable. Level dyeings are obtained, but there is the danger of crease marks.

(4) CONE—The hoods are placed over each other on a perforated cone, and the dye liquor is pumped from the outside through the cones. Temperatures approaching 95°C. are obtainable, and the pressure generated facilitates penetration. The advantage of cone dyeing is that the hoods are stationary and therefore their condition is preserved, but sometimes difficulties may be experienced in obtaining the same hue throughout a batch of hoods. Crease marks are not produced.

Owing to the higher temperatures possible in dyeing on cones and the Casse type of machine, Neolan dyes can be used, which are of special interest for certain hues which cannot be dyed sufficiently fast to water with acid dyes. For example, a heavy brown dyed with a combination of Tartrazine, Kiton Red G, and Alizarine Sapphire Blue CB is not as fast as a similar hue dyed with a combination of Neolan Yellow GR, Neolan Pink BA, and Neolan Blue 2G when subjected to a modified S.D.C. water test *(5)*.

Hoods may also be dyed in the half-planked condition, which entails the use of dyes such as the Fullacines, which show reasonable fastness to acid milling.

It is generally accepted that fur felt requires more dye than wool felt, which may be attributed either to optical effects or to differences in affinity of the two materials. An investigation of the latter point was carried out as follows—

The acid content of white wool and grey fur felt was first estimated, giving 1.8% sulfuric acid in the wool felt and 2.4% sulfuric acid in the fur felt.

Dyeing was carried out on a thermostatically controlled oil-bath set at 130°C., which gave a gentle boil of the actual dye solutions. A liquor ratio of 50:1 was employed and was kept constant by the use of finger condensers *(6)*. A number of level-dyeing acid dyes normally employed in the hatting industry were dyed at two strengths, and in every case the amount of sulfuric acid used was 4%, which was obtained by an addition of 2.2% acid with the wool felt and 1.6% acid with the fur felt. Glauber's salt (40%) was used in addition, and dyeing carried out for a total period of 2 hr. at the boil.

The residual dye liquors were estimated absorptiometrically by means of an Ogal colorimeter*, and the amount of dye taken up by the fiber was obtained by difference. The results are given in Table I from which it will be observed that appreciably more dye is absorbed by wool felt than by fur felt under identical conditions, which to some extent accounts for the different amounts of dye required to produce similar shades on the two types of material. It will be noticed that differences are shown with individual dyes.

Two-colored hats can be produced by dyeing with dischargeable acid or Neolan dyes, and treating one side of the hood with a hydrosulfite and a suitable thickener, followed by steaming. Color discharge effects are also obtainable by incorporating selected dyes which withstand reduction. Special effects, such as "peach bloom" and "carded" finishes, are obtained by subjecting the dyed hoods to special finishing processes.

The following recent developments in the hatting industry can be mentioned—

(a) Production of so-called "conforming hats" in the U.S.A. These are made from wool and are crushable and adjustable to any shape *(7)*. Such finishes can be reproduced with the use of suitable emulsions of polyvinyl acetate.

(b) Other protein fibers, from casein, peanut, and soya-bean, may be used along with wool or fur, and the introduction of these materials in small amounts does not materially affect the dyeing properties of the hoods.

(c) A method has been put forward in America for the dyeing of hoods during planking on a multiroller machine, but is limited to standard shades *(8)*.

(d) Optical bleaching agents are finding increasing application on hoods. They are colorless organic compounds having direct affinity for the fibers and possessing the property of absorbing light and re-emitting it in the form of a bluish or violet fluorescence. As a result whites are improved and pastel tones enhanced in brightness. Uvitex WS is of this type, and is applied with 4% acetic acid for 1 hr. at 50°C *(9)*. In the case of dyed shades, treatment is carried out after dyeing. The treatment withstands finishing processes such as blocking.

Acknowledgment of indebtedness to the ClaytonAniline Co. Ltd. for permission to give this paper is made.

REFERENCES

1. Freney, "Fibrous Proteins" (Bradford: the Society, 1946), pp. 178-192.

2. Martin, *J. Soc. Dyers Col.*, 60, 325 (1944).

3. Townend and Simpson, *ibid.*, 62, 47-52 (1946).

4. *BIOS*, 955: "German Hatters' Fur Industry".

5. The Society, "Second Report of the Fastness Tests Committee," reprinted from *J. Soc. Dyers Col.*, 64, 133-145 (April 1948).

6. The Society, "Report of the Committee appointed by Council to discuss the Dyeing Properties of Direct Cotton Dyes," reprinted from *J. Soc. Dyers Col.*, 62, 284 (Sept. 1946).

7. *Hatters' Gazette*, 72 (April 1948).

8. Tucker, *Amer. Dyestuff Reptr.*, 37, 483-493 (1948).

9. Landolt, *Textil-Rundschau*, 11, 376-382 (1948).

* Ogal Duboscq-type colorimeter (Tintometer Co. Ltd.).

THE USE OF VEGETABLE MUCILAGES IN SCREEN AND HAND BLOCK PRINTING*

AMONG the thickenings which find extensive use in silk screen and hand block printing, locust bean and tragacanth find general application. Locust bean thickening is the product of the tree shrub *Ceretonia Siligue* and is marketed in the form of bean flour. Incidentally, this product is known also as St. John's bread, due to a tradition that it formed St. John the Baptist's food in the wilderness.

Tragacanth is the gum from the shrub *Astralagus Verus,* grown in the Levant, and is marketed in the form of flat leaf-shaped pieces. Generally, the lighter in color the product, the better its quality and vice versa, the darker qualities containing more impurities in the form of wood, sand, etc. Gum tragacanth is also known as Gum Dragon, while the locust bean flours are sold under such names as Tragon, Hydrogum, etc. Both products are used as sizing and thickening agents by weavers and textile printers, the locust bean type finding extensive use as a sizing agent, either alone or mixed with sago flour, maize starch, etc.

PREPARATION OF THICKENINGS

Locust bean flour swells very quickly in cold water and when boiled for a short time—15 to 20 minutes—forms a useful and very soluble thickening for textile printing. The method of mixing requires careful supervision in that the flour is sprinkled into the cold water during constant stirring. A method whereby dry material and water are added together by means of a centrifugal mixer enables thickenings to be prepared rapidly without the formation of lumps. Thickenings of this type are prepared generally at a strength of 8 ozs. of dry material per gallon of water and are afterwards reduced with water to the consistency required in the particular instance. In general, print pastes containing 4 ozs. per gallon of dry material will give good results, while in some cases as little as 1 or 2 ozs. per gallon may be used where very thin print pastes are required, as, for example, in printing bold patterns on thick materials which are required to be well saturated with the print paste.

Tragacanth is prepared by soaking the material at 8 ozs. per gallon in cold water for 24 hours to allow swelling, followed by boiling from 4 to 6 hours to complete the process of producing a homogeneous thickening.

SCREEN PRINTING

In the printing of fast colors by screen, three classes of dyestuff are commonly used, namely, vat dyes, stabilized azoic dyes and the leuco esters of vat dyestuffs. In the application of these classes of colors both the thickening agents mentioned are used.

In the application of the vat dyestuffs two methods are commonly used:—

(1). The potash or soda ash—Formosul method.

(2). The Colloresine method.

In the first of these the dyestuffs are printed with thickenings containing alkali and reducing agent plus a hygroscopic agent, such as urea or glycerine, the fixation of the color taking place under the influence of steam in such arrangements as the rapid ager, star steamer, indanthrene steamer, etc. The thickening commonly used for these prints is a mixture of wheat starch, British gum and gum tragacanth. In this particular instance locust bean thickening is not applied, due to the fact that its resistance to alkalies is small when the made up colors are kept for fairly long periods. It should be noted here that for screen printing the soda ash method gives better results, and in many cases water absorbing agents, such as urea, should be omitted from the print pastes, especially where good steaming conditions are available.

The value of gum tragacanth here lies in the production of prints which are most easily penetrated, give better leveling, are softer to handle in the dry state and are more easily washed off.

The use of locust bean thickeners for the application of vat dyestuffs lies in their value when used after the manner of the colloresine process. The principle of this method is that the thickening agent employed, either methyl-cellulose or locust bean thickening, is rendered insoluble under the influence of free alkali and hot water. This means that the dyestuff in paste form can be thickened with a locust bean mucilage without the addition of either alkali or reducing agent, and printed in the ordinary way. Such prints, when dried, will keep indefinitely and their fixation postponed until such time as a quantity of prints has accumulated. Fixation of the dyestuff then takes place by passing the printed materials through a solution in a padding mangle containing the necessary reducing agent and alkali. For example, the solution may contain caustic soda and a reducing agent in the form of sodium hydrosulfite or sodium sulfoxylate formaldehyde at a high temperature. By this means a very quick reduction of the dyestuff is brought about when the thickening is in the insoluble state, fixation being assisted by the passage of the goods while still in the wet state immediately after padding through a small steam box, and developing being carried out through subsequent and continuous passage through oxidizing agents such as bichromate or peroxide solutions. Modifications of this method include padding of the goods in potash or soda ash formosul thickenings with intermediate drying and subsequent steaming in the ordinary way in a rapid ager or festoon steamer.

STABILIZED AZOICS AND LEUCO ESTERS OF VAT DYES

As these groups of dyestuffs are generally applied together by the acid steaming technique the observations on the thickenings used will apply to both. Generally, thickenings with a starch basis are used along with gum tragacanth where additional penetration is required. Levelness in blotch printing may be assisted by the use of British gums along with the starch tragacanth mixtures.

Where the neutral chromate process of acid steaming is used some fixation of the starch and the tragacanth by the chrome radical in steaming may be expected, with consequent stiffening and hardening of the printed goods. A higher proportion of British gum thickening in such cases may produce the necessary improvement, while, if much difficulty is experienced, some of the newer cold swelling and hydrolyzed starch products may be applied with considerable success. For the most part, however, thorough washing and soap boiling after development of the prints will produce the softness required, with the occasional use of desizing agents, such as malt extract, in difficult cases. With the stabilized azoic dyestuffs it is

(Continued on Page 567)

* Reprinted from Textile Recorder, May, 1950.

Proceedings of the
American Association of Textile Chemists and Colorists

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AUGUST 21, 1950

CONSTITUTIONAL AMENDMENTS ENDORSED BY COUNCIL

THE following proposals to amend the Constitution of the American Association of Textile Chemists and Colorists have received the endorsement of the Council and have been published in reports of Council meetings.

"In Article V, Section 2, change "two Vice-Presidents" to "four Vice-Presidents."

Change Article VI to the following:

"Section 1. Nominations for the offices of President and four Vice-Presidents shall be made each year by a Nominating Committee consisting of the Councilors representing Sections. The Secretary of the Association shall serve as Secretary of this committee, but without vote. One or more nominations by this committee for each of the five offices to be filled shall be published in the Proceedings of the Association not later than September first.

"For the office of President, nomination shall be by majority vote, or successive majority votes, of the entire Nominating Committee. For the nomination and election of Vice-Presidents, the Sections of the Association shall be grouped geographically into four Regions defined in the Bylaws. Nomination of candidates for the office of Regional Vice-President shall be by majority vote, or votes, of the Nominating Committee members from that Region.

"Section 2. Any additional nomination for President, signed by at least fifty Senior members, or for Regional Vice-President signed by at least twenty-five Senior members of that Region, may be filed with the Secretary not later than October first.

"Section 3. The Secretary shall mail to each Senior member by October tenth a ballot bearing the name of every nominee for President, and of every nominee for Vice-President from that member's Region. Ballots marked and returned within six weeks of mailing shall be counted within one week thereafter by the Secretary and two tellers appointed by the President. To each office that candidate receiving the largest number of votes shall be declared elected.

"If two or more candidates for President lead with equal numbers of votes, then ballots naming these candidates shall be mailed by the Secretary, within three days, to all the members of the Council representing Sections. On ballots returned to the Secretary within three weeks of mailing, the largest number cast for any one candidate shall determine the election. If two or more candidates for the same Regional Vice-Presidency lead with equal numbers of votes, a like procedure shall be followed, except that voting shall be confined to the Council representatives from that Region.

"The results of election shall be published by the Secretary in the next available issue of the Proceedings."

For Article VIII, Section 1, substitute the following:

"A proposal to amend this Constitution may be presented at anytime to the President or Secretary of the Association. It must be in writing and signed by one hundred or more Senior members, of whom the first shall be designated in connection with his signature as the Original Proponent.

"At the first meeting of the Council following receipt of the proposal, it shall be presented by the President or Secretary for discussion and shall be referred to the Committee on Constitution and Bylaws. This committee may make minor changes approved in writing by the Original Proponent, and shall report at the next following Council meeting, at which meeting the Council shall express its approval or disapproval by majority vote.

"In the form on which the Council voted, together with a record of that vote and a statement from the Original Proponent of the purpose of the amendment, the proposal shall be published in the next available issue of the Proceedings of the Association; and accompanied by printed copy of this record of vote and statement, it shall be submitted to vote of the entire Senior membership of the Association on ballots mailed with the next ballots issued for election of officers of the Association; except that at any time prior to such mailing the proposal may be withdrawn by the Original Proponent through written statement to the Secretary of the Association; and except that earlier balloting may be prescribed through request embodied in the original signed proposal and approved by the Council in connection with its vote on the proposal.

Affirmative votes on two-thirds of the ballots returned within six weeks of mailing, and from not less than twenty-five per cent of the Senior membership, shall make the amendment effective at once. If these requirements be not met in the first six weeks, additional ballots received in the next six weeks shall be counted."

As provided in the Constitution, these proposals will be submitted to letter ballot of all Senior members of the Association in connection with the election of officers this fall.

HAROLD C. CHAPIN,
Secretary.

CALENDAR

COUNCIL
Meetings: Sept. 28-30 (Portsmouth, N. H. Convention) Nov. 17 (New York).

NATIONAL CONVENTIONS
1950: September 28 to 30. Portsmouth, N. H
1951: October 17-18-19, Statler, New York.
1952: Boston.

HUDSON-MOHAWK SECTION
Meetings: Sept. 15 (Albany), Oct. 20 (Utica), Dec. 8 (Albany), Jan. 19, 1951 (Albany), Mar. 16, 1951 (Albany), May 11, 1951 (Albany), June 22, 1951 (Annual Outing).

MID-WEST SECTION
Meeting: October 28 (Chicago, Ill.).

NEW YORK SECTION
Meetings: October 30 (Swiss Chalet, Rochelle Park, N. J.), November 17 (Swiss Chalet), Jan. 12, 1951 (Hotel New Yorker), Feb. 23, 1951 (Hotel New Yorker), March 30, 1951 (Swiss Chalet), May 4, 1951 (Swiss Chalet), June 15, 1951 (Outing).

PHILADELPHIA SECTION
Meetings: October 28 (Meeting-in-Miniature, Philadelphia Textile Institute), December 8, January 17, 1951.

PIEDMONT SECTION
Meeting: October 28 (Charlotte, N. C.)

RESEARCH COMMITTEE
Meetings: Sept. (Portsmouth, N. H., Convention), Nov. 17 (New York).

RHODE ISLAND SECTION
Meetings: October 27 (Providence Engineering Society Hall), November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION
Meeting: Nov. 4 (Hotel Patten, Chattanooga, Tenn.).

SOUTHEASTERN SECTION
Meetings: September 23 (LaGrange, Ga.), December 9 (Atlanta, Ga.).

Erratum

THE eighth line of the middle column of page P457 covering Raymond W. Jacoby's article "Current Developments in Textile Processing," which appeared in the July 10 issue, is incorrect as it stands. The last two sentences of the paragraph in which the line appears should read as follows: "This would be a very large ager, expensive to construct and using a large amount of steam. It would require many rollers at top and bottom, with the face of the print touching alternate rollers."

In the following paragraph the seventh line mentions "a shallow chamber eight *feet* long." This should have been given as eight *yards* long.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-22

Education: Rutgers University, B. S., chemistry.
Experience: Chemist and plant manager, manufacture of organic chemicals, including textile.
Age 37; two dependents; East or South preferred, but not essential.

8-7, 8-21

50-23

Education; B.S. Chemical Engg., 1941.
Experience: Process development and control; for past three years, production of dyestuffs and intermediates.
Age 33; married; references; East preferred but not essential; technical sales, process development or production supervision.

8-7, 8-21

50-24

Education: S.B. Chem. Engg.; PhD., Chemistry.
Experience: Chemical research and laboratory direction, textiles and rubber.
Age 36; married; references; vicinity of New York City preferred but not essential.

8-21, 9-4

TWENTY-NINTH ANNUAL

CONVENTION

WENTWORTH-BY-THE-SEA
PORTSMOUTH, NEW HAMPSHIRE

SEPTEMBER 28-29-30

AUSPICES OF THE RHODE ISLAND SECTION

TRADE NOTES • NEW PRODUCTS

• New Birch Bros. Vertical Singeing Machine

A vertical singeing machine, equipped with either radiant or compression type burners, has been brought out by Birch Brothers, Inc., Somerville 43, Mass.

This machine is reported to be equipped with adjustable tension, air guiders (optional), and the necessary rolls for guiding the cloth to and away from the burners. The burners are supplied with pneumatic cloth throw-out bars. Enclosed beaters or brushes aid in removing ash. Overhead draw rolls and folder are supplied for speeds up to 100 yards per minute for use on worsted and other fabrics of animal fiber construction, the company states.

For cottons and rayons at higher speeds, draw rolls and quench box are reported to be furnished with overhead delivery reel. Drive may be by either constant or variable speed drive, and burners are said to be adjustable to control degree of singe. Fabrics may come to the machine either in trucks or in rolls with batch let-off.

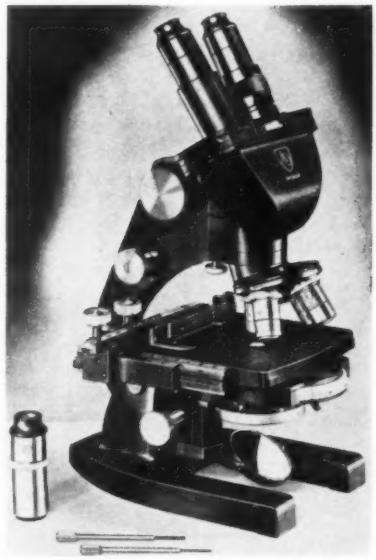
• Major Wildebush to Head Industrial War Mobilization Committee

A war mobilization committee headed by Major Joseph F. Wildebush, U. S. Army, Retired, industrial relations director, has been set up by the Silk & Rayon Printers & Dyers Association of America, Inc. David L. Benetar, general counsel, will act as adviser. Maj. Wildebush recently completed a course at the Industrial College of the Armed Forces in economic mobilization of American industry.

The committee is surveying plant facilities of members in preparation for plans for a swift transition from peacetime to wartime economy. Upon completion of the survey, results will be placed before the Munitions Board, the National Security Resources Board, and other Government and State agencies, it is reported.

• Cairns to Handle Dynel Promotion

Union Carbide & Carbon Corporation has announced the appointment of John A. Cairns & Co. to handle the advertising and promotion of dynel, its new synthetic fiber. Dynel is a product of the Carbide & Carbon Chemicals Division.



AO Spencer Phase Microscope

• New Microscope Series

A new series of AO Spencer Phase Microscopes with monocular and binocular bodies has been announced by American Optical Company's Instrument Division, Buffalo, N. Y.

Phase microscopy, a relatively new method of microscopy, permits the study of living organisms as well as other transparent materials of inherently low contrast.

The new light-weight phase microscopes have incorporated many improvements over the original models announced several years ago, it is stated. A company spokesman reports that they furnish "a most valuable research tool for many applications not possible with other types of microscopes."

Phase turret condensers with interchangeable annular diaphragms are now available in hardened steel, centerable mount. The mount is reported to be firmly held in the fork-type substage so that it cannot tilt, thus keeping the optical axis of the condenser and objective in alignment. The four annular diaphragms in the phase turret condenser may be centered to any series of four objectives, it is stated, and long focus annular diaphragms are also offered, which provide adequate working distance above the stage for micro-manipulation work, tissue cultures and the like.

The ball-bearing fine focusing adjustment of the microscope, which is graduated in two-micron intervals, is said to be highly responsive. The control knobs have been lowered to a more comfortable position nearer to the stage, providing for more adequate finger clearance.

Tension on the dual coarse and substage focusing controls may be set to suit individual needs. A new "pinch-grip" mechanical stage permits insertion of slides without disturbing the mechanical stage and the new quadruple dual-cone revolving nosepiece has an improved ball-and-groove spring stop which assures correct optical alignment of the objectives over many years of wear, it is stated.

A separate leatherette covered accessory case accommodates the phase turret condenser, objectives and centering telescope.

American Optical Company's main offices are in Southbridge, Mass.

• New Range of Neutral Dyeing Colors

A new range of neutral dyeing colors, recently introduced by the Dyestuffs Division of the Du Pont Company, is said to possess interesting application and fastness properties on both nylon and wool. These are marketed under the trademark, "Neutracyl," and comprise the following members: "Neutracyl" Blue G, "Neutracyl" Yellow N, "Neutracyl" Yellow 3RD, "Neutracyl" Black N.

The outstanding light fastness of these dyes on nylon is particularly significant, the company states, and they show similar characteristics on wool. They reportedly possess good saturation affinity and can be used either alone or in the production of combination shades. "Neutracyl" dyes are recommended by the company for the dyeing of suiting fabrics, shirtings, automotive and other transportation fabrics, sportswear, athletic goods, etc.

The division also recently put on the market "Pontamine" Fast Violet 4RL dye, a direct-dyeing color reported to possess outstanding fastness to light when applied either to cotton or viscose-process rayon in pale and heavy shades. On rayon, the color is said to show good resistance to washing, dry cleaning, perspiration, and dry crocking. The product is well suited to the production of deep reddish-violet and mauve shades and also is useful as a reddening element in the formulation of beige, gray, and taupe shades, it is stated. It is recommended by Du Pont for use on draperies, upholstery fabrics, dress goods, and similar materials that have to be resistant to light.

• Textile Sessions to Feature ASME Fall Meeting

The American Society of Mechanical Engineers will hold its Fall Meeting in Worcester, Mass., Sept. 19-21 at the Hotel Sheraton. Some 50 papers will be delivered at 24 technical sessions. There will be four textile sessions. Topics to be covered include plastics in the textile industry, industrial applications for nylon plastics, basic distribution of cost dollar in textile manufacturing, site selection and construction of worsted and woolen mills for low cost operation, production crimping of natural fibers and the construction of modern cotton and rayon mills. An ASME analysis of textile mill modernization will feature one of the sessions.

James D. Cunningham, president of the society, will speak at the President's Luncheon on the opening day of the meeting after which the society will be welcomed by Mayor Andrew B. Holmstrom of Worcester, who is himself an ASME member. The Worcester Section of the society will act as host to the meeting. John Woodman Higgins, chairman of the board of the Worcester Pressed Steel Company, is general chairman of the Fall Meeting Committee. Dr. James R. Killian, Jr., president of Massachusetts Institute of Technology, will be the banquet speaker, on Wednesday evening, Sept. 20.

Many prominent speakers including several noted foreign professors will highlight meetings of the Wood Industries Division, the Hydraulic Division and the fuels and power sessions.

The safety, management and materials handling divisions of the society will cooperate to sponsor a technical session. Papers to be presented at the session will deal with building safety into textile machinery, dust hazards relative to grinding operations and the declining accident rate due to substituting machines for men in materials handling operations.

Inspection trips will be made to the following plants in Worcester: Worcester Pressed Steel Company; John Higgins Armory; Norton Company, Abrasive & Machine Division; Heald Machine Company; Crompton & Knowles Loom Works; Telechron Company; Reed Prentice Corporation. Other plants to be visited include General Electric Co., Fitchburg; Bay State Abrasive Products Company, Westboro; Wyman-Gordon, North Grafton; General Motors Corporation, Framingham, and Heywood-Wakefield Company, Gardner, all of Massachusetts.

• Darco Merges with Atlas

In a merger effective July 31, 1950, Darco Corporation, a manufacturer of activated carbons and formerly a subsidiary of Atlas Powder Company, became the Darco Department of that company.

Product, personnel and distribution will be continued, it is reported. Darco plant expansion at Marshall, Texas, is being pushed to the earliest possible completion.

Darco activated carbons were first produced over a quarter of a century ago, the Darco trademark being registered in 1919. Darco carbons are used among other things for the purification of chemical products, drugs and pharmaceuticals, water supplies, textile chemicals and dry cleaning and electroplating solutions.

• C.C.N.Y. Fall Textile Courses

Specialized programs in Elementary Textiles, Advanced Textiles, and Textile Testing and Fabric Analysis, will be offered by the Evening and Extension Division of the City College School of Business during the 1950 Fall Term.

Elementary Textiles will present a study of the basic textile materials, their nature, source, characteristics, application and uses; the weaving, dyeing and finishing of fabrics; the processes of manufacture from raw material to consumers' goods; use, advantages, and disadvantages from consumer point of view, and standards and tests. The program in Advanced Textiles aims to acquaint the student with the names and identifying features of staple textile fabrics used in women's, girls', infants', men's and boys' wear; domestic and home furnishings, and approximate prices per yard and widths in which the fabrics are woven.

The Textile Testing and Fabric Analysis will include an analysis of textiles, both fibers and fabrics, by means of tests to evaluate their physical properties. Also covered will be the care and use of apparatus for physical testing; identification of fibers by means of the microscope, grading of fibers and analysis of yarn numbering systems; fabric construction and point paper designs; use of the analytical balance, tensile testing machines, and spray tester; and color fastness tests. This course is designed to give special attention to the needs of students entering the wearing apparel industries.

Applicants for the courses should register in person in the Auditorium of the City College School of Business, 17 Lexington Ave., New York City from 11:00 a.m. to 1:30 p.m. on Sept. 16, or from 6:00 to 8:30 p.m. on Sept. 18, 19, and 22.

• NETF Awards 94 Scholarships

The New England Textile Foundation has awarded a total of 94 scholarships at textile schools in New England for the coming scholastic year. Thirteen of these scholarships will be at Bradford-Durfee Technical Institute, Fall River, Mass., 52 at Lowell Textile Institute, Lowell, Mass., 9 at New Bedford Textile Institute, New Bedford, Mass. and 20 at Textile School of Rhode Island School of Design, Providence, R. I. Scholarship winners are permitted to select their own school, provided it is a textile school in New England.

This is the fourth year of the Foundation's scholarship program and its first group of scholarship holders (14 in all) were graduated this year. Foundation scholarships normally have a value of $500.00 per year and are subject to renewal each year provided the student maintains the required rating.

Students who wish to compete for a freshman scholarship at a textile school in New England must be high school graduates or high school seniors not over 25 years of age. They must also make application to New England Textile Foundation and take the standard aptitude test given by College Entrance Examination Board each spring.

Scholarship awards are made on the basis of scores obtained, provided the student can meet the entrance requirements of the school of his choice. Anywhere from 15 to 30 freshmen scholarships are awarded each year, the actual number depending on funds available.

• Dr. Snell Announces New Laboratory Contracts

The letting of contracts for the first unit of new laboratories in Bainbridge, New York, has been announced by Dr. Foster Dee Snell, President of the research and engineering firm of Foster D. Snell, Inc., New York. It is reported that construction will be of concrete and brick on approximately one acre acquired for the purpose. The present structure is a single wing of a structure providing for four wings with extensions. This first unit will be occupied by the firm's Supplee division conducting vitamin work and supplying animals to other laboratories.

Dr. Snell states that the project does not envisage any change at present in their activities in New York, but does provide for future expansion and in particular for the carrying on of long-term projects in a rural area where living costs for personnel are substantially lower than in the large cities. When conditions require more space, separate departments can be transferred from New York to the new location to relieve congestion in their present building at 29 W. 15th Street, in New York. It appears probable that the

next unit to be constructed will be either a drafting room for their engineering department or a pilot plant to release the area used in New York at present for that purpose, it is stated.

• Gross Completes New Laboratory Building

A. Gross & Company, 295 Madison Avenue, New York, N. Y., recently announced the completion of a modern Laboratory Building at their main plant in Newark, N. J.

The structure has been functionally designed and equipped for the control, development and technical servicing of fatty acids. Of the two floors, comprising approximately four thousand square feet, the first is devoted primarily to production control, the second to research work.

An enlarged technical staff will be headed by Raymond E. Wiech, Technical Director.

• Belle Opens Boston Branch

George O. Linberg, Vice-President of the Belle Chemical Company, Inc., has announced the opening of a branch office and laboratory at 19-25 High Street, Boston 10, Massachusetts.

Joseph W. Russell, formerly Chief Chemist of the Otis Company at Palmer, Massachusetts, and formerly Chief Chemist of the Nashua Manufacturing Company, Nashua, New Hampshire, will be head of this laboratory and in charge of customer service.

• Fielden Occupies New Offices

Fielden Instrument Corporation recently announced the occupation of new and larger office and factory space at 2920 North 4th Street, Philadelphia 33, Pa. The name of the company has been changed from Fielden Electronics Incorporated. Existing personnel and policy will be maintained, it is reported. Fielden, manufacturers of the Drimeter for moisture content control in the textile industry, are expanding their range of products with the introduction of a relative humidity controller, liquid level control, graph recorder and other instruments and industrial controls.

• SOCMA Meeting Dates

Luncheon meetings of the Synthetic Organic Chemical Manufacturers Association of the United States will be held on September 13, October 11, and November 8. The annual meeting and dinner will be held December 13.

Edward McCoy

• Refined Products Canadian Representation

Refined Products Corporation, Lyndhurst, N. J., has announced that Reliable Color and Chemical Company will be their exclusive representatives in Canada.

Reliable Color and Chemical is a new dyestuff company recently established by Edward McCoy and Thomas Rostron on a partnership basis. The new concern, which will also represent other leading U. S. and British manufacturers, will maintain offices in Hamilton and Montreal as well as a warehouse in Hamilton. The Hamilton office will be located at 43 Hughson Street North; the Montreal office at 4577 Melrose Avenue.

Both Mr. McCoy and Mr. Rostron have had many years experience in the dyestuff and chemical industry in Canada. Mr. McCoy arrived in Canada in 1919 after several years in the United States. He has been connected with many leading Canadian firms and was the first secretary of the Ontario Section of the Canadian Association of Textile Colourists and Chemists. Mr. Rostron came to Canada from England in 1920 where he gained experience in dyestuff manufacturing and laboratory work. He has an extensive background in color application and laboratory control.

Thomas Rostron

• Georgia Plant of A-TCC Opened

The Georgia plant of Aniline-Textile Chemical Co. was formally opened in Dublin, Ga. recently, with an open house.

Roland Derby, founder of the firm, accompanied by 24 associates, flew from Lawrence, Mass., for the three-day opening.

K. D. Henry, vice-president and southern head of operations, was in charge of the opening and entertained the visitors with dinners and a reception at the plant.

The building consists of 8,000 square feet and houses, offices, laboratories and warehouses. Here the company will maintain a supply of dyestuffs, chemicals, solvents, oils, detergents and Calgon, Mr. Henry said.

Since its founding in Lawrence in 1940, the firm has broadened into many other manufacturing areas and now has branches in Massachusetts, New York, Rhode Island, Pennsylvania and North Carolina, with Georgia now added.

• Good Light Fastness Features Perliton Dyestuffs

Outstanding fastness to light is one of the features of the Perliton line of dyestuffs now being handled by Hodges Associates, 11 W. 42nd Street, New York, N. Y. Under the standards of the Fastness Committee of the Association of German Chemists the entire line shows from better than moderate to excellent (4-7) fastness, it is reported. Yellows, violets and blacks appear to give best results.

Perliton Brown G is especially recommended by the manufacturer for the dyeing of nylon or Perlon (German) hosiery. It is reported suitable to all kinds of material made of nylon and Perlon as long as no high quality with regard to washing is required. Light fastness is reported good with wash and perspiration fastness answering current requirements of the hosiery industry. Leveling properties of the dyestuff are also reported to be good.

Very good fastness to rubbing and very good to good fastness to decatizing are outstanding properties of Perliton Brown G, it is stated. It is further stated that fastness to milling, sea water and bleaching are good with sufficient to good fastness to water and scrooping. Fastness to chlorine and sulfur are said to be sufficient and moderate, respectively. In regards overdyeing, sufficient to good fastness in a neutral bath and moderate to sufficient fastness in an acid bath are claimed.

Further information on properties and dyeing methods for the Perliton dyestuffs may be obtained from Hodges Associates.

• Halbach Retires From GDC

E. K. Halbach, former president of General Dyestuff Corporation, has retired. Mr. Halbach, who spent more than 50 years with GDC and its predecessors, had been active in an advisory and consulting capacity though he had been eligible for retirement since Jan. 1, 1948.

Following his graduation from Westchester Teachers' College, he started his long career in the dyestuff business with William Pickhardt & Kutroff, largest importers and sellers of dyes about 1900. He attained sales manager and became a member of the board from 1920-1926. At the time of General Dyestuff Corporation's organization he became secretary and general manager. He was on the board from 1926 to 1942, and was president from 1930 up to the time of the United States entry into World War II.

Born in Philadelphia, Pa., Mr. Halbach has been a resident of Short Hills, N. J. for many years.

• Blue Dri-Water Concentrate

Dri-Water, a pure, distinct, transparent concentrate is said by its manufacturer (the Miskella Infra-Red Company, Grand Ave., Cleveland 4, Ohio) to cut drying costs by making it possible to use less heat. When used to replace ordinary water for rinsing metal and other solid materials, it is said to shorten the drying time to completely dry-off the surfaces for further processing. A light, uniform coating of water approximating a fog blown by a person's breath on a cold surface results, it is stated.

Freedom from water stains results in elimination of spots, stains or streaks, it is claimed. The company states that the product may be sprayed, brushed or directed to the work by flo-coat or needle point showerbath.

Complete information may be obtained from the manufacturer.

• Hooker Signs 5-Year Contract with Employee's Union

F. W. Dennis, Director of Industrial Relations of the Hooker Electrochemical Company, has announced the signing of a five-year contract with the Niagara Hooker Employee's Union for the company's plant at Niagara Falls, New York. Nearly 50 items were negotiated including a general pay increase of 6 cents an hour, hospital and surgical benefits to include dependents (the company paying 80% and the employees 20% of the cost), and the company payment of 100% of the New York State Disability Insurance cost.

Vacation schedules have been augmented to give 2 weeks vacation with pay at the completion of 2 years service rather than 3 years as formerly. The regular schedule of 3 weeks vacation after 15 years of active service, and 4 weeks weeks after 25 years is maintained. A new feature of the vacation schedule permits postponed vacation time to be used during the following year.

The contract may be reopened by either the company or the union for consideration of general rates of pay on the first and second anniversaries, and for general rates plus additional monetary issues on the second and fourth anniversaries. Continuing over forty years of industrial peace at the Hooker Company, the new five-year contract agrees to no strikes, slowdowns or lockouts.

In addition, death-in-family benefits are extended to include parents-in-law; wartime military service benefits of one month's pay for inducted employees were reinstated; liberalized arrangements were negotiated for holidays not worked, call-ins, holiday pay, overtime payments and starting rates.

In addition to the new contract, the Hooker Company will continue its group life insurance program and its complete retirement program, the latter having been in effect since October, 1946. The pension plan has been revised so that an employee with 20 years or more of service will receive a minimum pension of $100 a month including Social Security at retirement.

The Niagara Hooker Employee's Union is an independent union having been certified by the National Labor Relations Board in 1945 as the sole and exclusive bargaining agency of the company's employees.

• Bangor Mills 1950 Retirement Contribution

George H. Korn, Vice-President of Bangor Mills, Inc., Pen Argyl, Pa., and Bangor, Pa., has announced the firm's seventh year contribution to their Employees Retirement Plan. The new contribution for year 1950 amounts to $30,343; total since June, 1944—$189,471.12. 28 new participants were added on June 15, 1950. The plan is based upon a formula that considers the number of years of service along with average monthly compensation.

During the past seven years, Bangor Mills, Inc. Pension Trust is reported to have paid their employees and their dependents over $32,000 for severance and death claims. The average pension provided for each employee under the plan is said to approximate $100 a month in addition to Social Security benefits and company-sponsored hospitalization benefits.

Bangor estimates the average death benefit per participant under the plan approximates $10,000.

• Triethylene Tetramine Price Reduced

A price reduction for triethylene tetramine to 40 cents per pound in tank car or compartment tank car lots was announced recently by Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y., representing a drop of 10 cents per pound.

Triethylene tetramine is used in the synthesis of ion exchange resins, asphalt additives, and various textile auxiliary chemicals. The lower price of triethylene tetramine is said to make it an economical extender for tetraethylene pentamine which is in short supply.

• Lille Exhibition Drawing Widespread Interest

The International Textile Exhibition, slated for Lille, France, April 28-May 20, 1951, is said to be meeting with genuine enthusiasm on the part of manufacturers everywhere, including numerous large U. S. textile equipment manufacturers to whom a central portion of the Machine Hall will be allocated.

It is reported that a number of countries will build their own pavilions to present their national products globally including Belgium, Canada, Holland, Italy, Portugal, Switzerland and West Germany.

The Hall of the Exhibition has a main entrance measuring over 520′ x 160′ which is being rebuilt into a shining wall of aluminum.

The Haute-Couture will reproduce a lively Couturier's studio and there will be numerous presentations of select models displaying latest Paris fashions, it is stated.

Information on the Exhibition may be obtained from George D. Boinet, 10 Rockefeller Plaza, Suite 1003, New York 20, N. Y.

• National Starch Products Elects Director

Edward B. Conway has been elected a director of National Starch Products Inc. He is vice-president and director of F. Eberstadt & Co. Inc., and is also a director of Chemical Fund, Inc., Elliott Company and Hastings Manufacturing Company.

• Evans Named to New Hercules Post

Forest B. Evans has been named assistant to the general manager of the Virginia Cellulose Department of Hercules Powder Company in Wilmington, according to a recent company announcement. Mr. Evans is at present plant manager of the Virginia Cellulose plant at Hopewell, Virginia. He will be succeeded at Hopewell by Orval J. Hand, who has served as assistant plant manager of the Virginia Cellulose Plant since 1946.

Mr. Evans joined Hercules in 1929 at the company's Experiment Station, Kenvil, New Jersey. Shortly afterwards, he was transferred to the Hopewell Plant as a research chemist. In 1934 he was named chief chemist and in 1940 he was promoted to assistant superintendent. Two years later he was made superintendent. He became plant manager in 1946.

Mr. Hand joined Hercules at the Parlin, N. J., plant in 1935, as a project engineer. In 1941 he was transferred to the Hercules-operated Badger Ordnance Works, Baraboo, Wisconsin, serving successively as maintenance superintendent, plant engineer, assistant plant manager, and plant manager, before being named assistant plant manager at the Virginia Cellulose Plant.

• Dr. Smith Visits European Research Centers

Dr. Leonard Smith, Director of Utilization Research for the National Cotton Council of America, is reported to have left July 28th for an inspection tour of leading textile research centers in Europe.

The Cotton Council official's itinerary includes visits to the Shirley Institute near Manchester, England, and similar organizations in Sweden, Denmark, the Netherlands, Germany, France and Switzerland. The purpose of Dr. Smith's trip is to ascertain the progress and effectiveness of European textile research programs. The extent to which research results are actually utilized in mills will receive particular attention, the report states. Dr. Smith will also check on research efforts being made abroad on specific research projects such as processing, techniques, quality improvements and new textile machinery developments and will report his findings to the U. S. textile industry following his return to Washington in August.

During his stay in England, Dr. Smith will accompany Dr. G. E. Hilbert, Chief of the Bureau of Agricultural and Industrial Chemistry at the U. S. Department of Agriculture.

Albert H. Rant

• Laurel Appoints Rant to New England Post

Laurel Soap Manufacturing Co., Inc., Philadelphia, has announced the appointment of Albert H. Rant of Edgewood, R. I., as their New England sales and technical service representative.

Mr. Rant, a graduate of Lowell Textile Institute has had wide experience in the manufacture and application of synthetic agents and other auxiliary products. An active member of the AATCC, he is at present secretary of the National Committee on Standard Soils.

• Two New Houghton Directors

The election of two new members to the Board of Directors has been announced by E. F. Houghton & Co. The elections were held at a meeting on July 21st at the company's main office, 303 W. Lehigh Ave., Philadelphia.

The newly named members are D. C. Miner, advertising manager who joined the firm in 1934, and William K. Barclay, Jr., Philadelphia resident partner of Stein Bros. & Boyce, members of the New York and other leading Stock Exchanges.

Mr. Miner is also president of Exhibitors Advisory Council, a director of National Industrial Advertising Association and past president and director of Eastern Industrial Advertisers, Philadelphia Chapter of the N.I.A.A.

• Hooker Organizational Changes

The Hooker Electrochemical Company, Niagara Falls, N. Y., has announced organizational changes involving four technical men. Joy E. Beanblossom has been made Manager of Development, James S. Sconce has been made Manager of Research and Dr. Bruno H. Wojcik has been named as Assistant to the Technical Superintendent. In the Sales Development Department, James S. Walker has been appointed as Supervisor of Technical Sales Service.

Mr. Beanblossom has been with the Hooker Company since 1929 starting as a chemical operator. In his new capacity Mr. Beanblossom will have charge of pilot plant operations, research manufacturing and research engineering.

Mr. Sconce was with the Cornstalk Products Company prior to coming to the Hooker Company in 1930. He has directed the product application program and with Dr. Wojcik has supervised the research fellowships.

Dr. Wojcik will handle all technical problems relating to product quality and improvement. He has been with the Hooker Company since 1934 in charge of hydrogenation research and as a research supervisor. During the war, he was in charge of development of the Manhattan District Project Work at the Hooker Company.

Mr. Walker has been with the Company since 1940 and has been engaged in research and plant operations, process supervision and technical service. He will have charge of technical service relating to packaging, shipping and handling of the Company's products, technical correspondence and product specifications. His sales service activities will also include the Hooker metal cleaning process using "Virgo Salt."

• Synthane Appoints New Salesman

Synthane Corporation, Oaks, Pa., has appointed Frank Schleicher as assistant to Howard Tyner, manager of the company's Milwaukee sales office. In his new assignment, he will serve customers in Wisconsin, Minnesota and northern Michigan.

Mr. Schleicher has had industrial experience in the plants of the Square D Co. of Detroit and A. O. Smith Corp. in Milwaukee.

• Three New Atlas Appointments

Three personnel appointments of the Atlas Mineral Products Company, Mertztown, Pennsylvania, have been announced by George L. Wirtz, President.

Edison C. Sickman, formerly Baltimore District Sales Mgr., has been appointed General Sales Coordinator. Prior to joining Atlas he worked in various phases of management and sales in the plating supplies and metal finishing fields. He is a graduate of the University of Dayton.

Ray Russell Graver has accepted a posi-

tion in the Atlas Engineering Department. Mr. Graver recently received his B.S. degree in Chemistry at Muhlenberg College.

Gerald F. Gilbert, Jr., who recently received his B.S. degree in Chemical Engineering from Lehigh University, has accepted a position as assistant to the Technical Director.

• Koppers Research Appointments Announced

Appointment of Raymond H. Hartigan as manager of the laboratory section of the central Research Department of Koppers Company, Inc., has been announced by Dr. Frank D'Alelio, Vice President and Manager of the Research Department.

Dr. D'Alelio has also announced the appointments of Gordon Black as assistant manager of the development section, and Peter W. Sherwood as manager of the engineering branch of the development section of the Research Department.

A native of Rensselaer, N. Y., Dr. Hartigan held a fellowship at the Mellon Institute of Industrial Research from 1941 to 1947 and from 1947 to 1950 he was a Senior Fellow at the same Institute. Dr. Hartigan was an evening instructor at the Pittsburgh extension of Pennsylvania State College from 1942 to 1944. From 1946 to 1949 he was an evening instructor at the Carnegie Institute of Technology. He joined Koppers in January, 1950.

Mr. Black was a research chemist at Mellon Institute from 1941 to 1948, when he joined Koppers Research Department. Mr. Sherwood joined Koppers' Research Department in 1943.

• Dye Penetrant Inspection Method Described

Dy-Chek, a dye penetrant method of inspection of metals, is described in a new circular issued by Dy-Chek Company, division of Northrop Aircraft, Inc., 1515 East Broadway, Hawthorne, California. The chemical process is used for manufacturing inspection, receiving inspection and preventive maintenance.

• Niacet Bulletin on Sodium Diacetate

A new bulletin (2A) on Niacet Sodium Diacetate presents the physical properties, latest specifications, and shipping and handling information on this chemical. Sodium diacetate, a source of solid acetic acid or sodium acetate in granular form, is used in dye works and laundries for controlling alkalinity. Copies can be obtained from Niacet Chemicals Division, 971 Niagara Building, Niagara Falls, N. Y.

Emil M. Marcin

• Commonwealth Appointment

Commonwealth Color & Chemical Company, 3240 Grace Avenue, New York 67, N. Y., has announced the appointment of Emil M. Marcin as Sales Representative in the Middle West. Mr. Marcin was formerly connected with Manhattan Print Works for more than seven years. Following three and a half years in the Navy, he went with American Viscose Corp., and later to Laros Silk Co.

• Birch Brothers Announces New Circulars

Birch Brothers, Inc., 32 Kent Street, Somerville 43, Mass. have announced the release of seven new circulars giving descriptive material and information on several Birch machines.

Among the products covered in the circulars are the following:

Heavy squeeze roll unit with built-in folder and variable speed motor drive-in for padding and extracting, capacity 15 tons. This machine is fitted with roller bearings and air cyiinders for applying pressure. (Circ. #1062).

Ceiling type square frame folder with swing rolls—for making the fold, mounted on a horizontal axis. The machine is reported to be ball-bearing throughout. (Circ. #1083).

Two-roll batcher, ball-bearing throughout. (Circ. #1088).

Seven tank stainless steel roller bearing open width machine—for scouring, open soaping, crabbing dyeing, etc. Each pair of squeeze rolls is operated by a separate DC motor controlled by a built-in dancer or compensating roll. Pressure is supplied by air cylinders or air motors. The final nip is of 15-ton capacity for extracting. (Circ. #1073).

Four tank machine for open-width processes, squeeze rolls running in roller bearings, pressure applied by air cylinders, and the drive by DC motors on each nip controlled by built-in dancer or compensating rolls. (Circ. #1106).

Tandem mangle combining water mangle and starch or softening mangle in one machine. The machine is so made that any pressure may be applied instantaneously by operating the valves which regulate the pressure applied by the air cylinders, the company states. This machine is reportedly simpler and more accurate than the Mi-cro-set mangle. (Circ. #1066).

Two roll heavy duty padder with drive on the top roll arranged for applying resin treatments, etc. This machine is fitted with a variable speed drive. (Circ. #1102).

• Deterioration Prevention Abstracts

"Prevention of Deterioration Abstracts," published by the National Research Council (Prevention of Deterioration Center, Room 204), 2101 Constitution Avenue, Washington 25, D. C., are being offered for subscription on a yearly basis. Abstracts are classified under the headings: Biological agents; Electrical and electronic equipment; Fungicides and other toxic compounds; Lacquers, paints, and varnishes; Leather; Lubricants; Metals; Miscellaneous; Optical instruments and photographic equipment; Packaging and storage; Plastics, resins, rubbers, and waxes; Textiles and cordage; and Wood and paper. One volume of approximately 2000 looseleaf pages is published each year in monthly issues. Subject and author indexes are compiled annually to cover abstracts issued from July through June. The yearly rate of $50.00 includes two sturdy binders and index tabs.

An Advance List, a monthly bibliography of all reports received in this field, is available for $10.00 a year.

• 4th Edition of Special Finishes Guide Issued

Interest and demand for the Testing League Bulletin "Special Finishes for Service, Protection and Appearance" have prompted the United States Testing Company, Inc. to issue a fourth edition of the helpful reference guide.

The finishes are listed alphabetically under their trade names and manufacturer. Properties are briefly listed as well as applicability to cotton, rayon, linen, wool, silk, nylon, vinyon, vicara, and blends.

Copies may be obtained from the United States Testing Company, Inc., 1415 Park Avenue, Hoboken, N. J.

• Solid Fatty Acids Bulletin

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio, has announced publication of a bulletin, "Emery's Solid Fatty Acids," available on request.

Information on specifications, characteristics such as stability, composition, high quality, uniformity, and their effect on finished products utilizing fatty acids is included in the bulletin. Other factors such as processing methods and packaging are also covered by the report.

• Fatty Alcohols Data Sheet

A new data sheet by M. Michel and Company, Inc., 90 Broad St., New York 4, N. Y., showing typical analyses of Cachalot fatty alcohols is now available to chemical manufacturers and distributors.

This listing covers cetyl, oleyl, and stearyl alcohols, and mixtures of them.

Mucilages—

(Continued from Page 558)

always safer to use gum tragacanth rather than the locust bean type, due to the poor keeping qualities of the latter under the influence of free alkali. Here again, however, modifications in the print paste formula may allow substitution of locust bean thickening for tragacanth. For example, in the production of very light shades, and in a good many members of the series of stabilized azoics, even in the darker colors, the proportion of free alkali in the form of caustic soda may be very considerably reduced. Again, the use of solvents and developing agents like diethylene glycol and dimethylamino ethanol, which are used for the development of these dyestuffs in neutral steaming, introduces the possibility of the use of the cheaper locust bean instead of the more expensive tragacanth.

CHROME MORDANT DYESTUFFS

Thickenings here also consist largely of starchy bodies which may be mixed in various proportions with British gums and either tragacanth or locust bean thickener. One of the main difficulties is the hardening of the prints with the chrome mordant during the process of fixation. This has largely been overcome by the use of special mordants, such as chromium lactate, together with the addition of such solvents as urea. The effect here is to inhibit the formation of the chrome-starch complex during steaming and so produce a softer handle in the finished goods.

In this, as in all other classes of coloring matter for printing, the value of the starch basis lies in the increased color yield obtained. Where levelness is required, a higher proportion of British gum is necessary. This, in turn, affects the color yield adversely, mainly by the reducing action of the dextrine formed in the conversion of starches to gums. In all cases, however, where penetration is an important factor, the addition of either tragacanth or locust bean thickening will provide valuable assistance and will, in addition, enable color yield to be maintained.

CELLULOSE ACETATE DYESTUFFS

With this class of coloring matter there are no involved chemical reactions such as the alkaline reducing action of the vat dyestuffs or the strong oxidizing reaction in the case of leuco esters of vat dyes.

The print pastes are simply prepared by the addition of the dyestuff, already mixed to produce a variety of shades, to the prepared thickening which may take the form of a pure gum tragacanth or pure locust bean thickening. Other thickenings, such as starches, gums, etc., may also be applied with equal facility in the actual printing operation. Where, however, good penetration of the prints and ease in subsequent washing off are the prime essentials, vegetable mucilages take first place. In this particular type of printing the starches and gums which may or may not be mixed with a proportion of vegetable mucilage find application only where penetration is either not required or else is avoided for special reasons. For example, in the printing of some types of dress goods fabric by the "sticking down" method on screen-table tops, it is important to avoid excessive penetration, with consequent soiling of the table tops which, in turn, will require frequent washing. This is achieved by using thicker print pastes with a higher proportion of solids content in the form of British gum, etc., so that penetration is reduced to a minimum. It should be borne in mind here that good fixation in subsequent steaming is necessary when using this method of application due to the fact that the large solid content of the thickener inhibits, in some degree, the penetration of the steam into the fiber and prevents to that extent the absorption of the dyestuff by the swollen fibers. Where poor fixation results in such cases, it is plain that trouble will be experienced later in washing off, due to the bleeding and marking off of surface dyestuff.

As may be gathered from the foregoing remarks, the use of the vegetable mucilages in such types of printing where penetration is essential has many advantages and will result in better fixation of the dyes in steaming, clearer and brighter color effects, cleaner grounds in washing off, and a softer handle and finish.

ACID AND DIRECT DYESTUFFS BY THE UREA PROCESS

The remarks which have been made relating to the cellulose acetate dyestuff printing also apply very largely to the above dyestuffs. These dyestuffs in most cases are easily soluble in hot water and this solution is then added to the made up thickening to form the print paste. Due again to the absence of chemical reagents of any kind the made up print pastes have good keeping qualities, especially when small quantities of preservatives have been added in the case of the locust bean type, and very good results will, in all cases, be obtained with the use of either of the mucilages under discussion.

Where, however, mixtures of thickenings are used for any purposes it should be borne in mind that many of the acid and direct dyes are easily susceptible to a reducing action, especially under the influence of steam for fixing the colors, and for this reason large quantities of British gum thickeners should, if possible, be avoided. On the other hand where such additions are found to be necessary, a small amount of a mild oxidizing agent in the form of one of the resist or reserve salts commonly used will prevent this reducing action and will preserve the color values of the dyestuff in printing.

It should be observed here that one of the outstanding points in the use of mucilages of these types is their great solubility and easy removability. This is of particular value in screen printing where large quantities of thickening agents are applied. For example, the general experience is that somewhere about three times the amount of thickening agent is applied by screen as compared with roller printing, and the greater the solubility of the thickening agent the more easily the prints will be handled in wet processing.

HAND BLOCK PRINTING

Similar observations with reference to the foregoing remarks on print pastes and dyestuffs apply equally to hand block printing.

Some detailed observations of the various applications of the vegetable mucilages, may however, be of interest. For example, in the printing of nylon

with hand blocks on which the pattern is built up with fine copper strips, the use of a tragacanth thickening was found to give good results. The main points here were that very fine printed effects can be obtained using a very thick solution of tragacanth at 6 to 8 ozs. per gallon of a good quality product. The low solid content of the thickening enables good penetration of the print to be obtained while the clarity of the color is, at the same time, preserved and, due to the good fixation in steaming, it is possible to process the goods without washing. The dyestuffs used in this particular instance were selected members of the cellulose acetate range of colors.

BLOTCH PRINTING

In the printing of all classes of dyestuffs by hand block in blotch patterns, it is often essential to obtain simultaneous levelness and penetration of the print. In many cases this can only be obtained by the addition of gum tragacanth which, in such circumstances, gives rather better results than locust bean thickening. In many cases, however, good coverage of the pattern and penetration cannot be obtained unless the face of the block is covered with a layer of cotton material in order to assist the furnishings of the face of the block. In some instances covering of the face of the block in this way is not feasible, due to the fact that fine white effects are carried through the blotch portion of the pattern and would easily fill up in printing if cotton coverings were applied. In such cases levelness will have to be obtained by the use of thickenings with a higher solid content, such as British gums, etc., and penetration may have to be sacrificed to some extent, although, in many cases, it may be possible to compromise by adding a proportion of tragacanth to such thickening agents, together with other expedients such as the addition of wetting agents to the print paste and the preparation of the fabric prior to printing in solutions of wetting out agents.

Where wood surfaces only can be used some assistance may often be obtained by "facing" the block by rubbing it on an absolutely flat block of sandstone or on a flat surface with a sheet of glass paper. In broken up designs good penetration will readily be obtained by the addition of tragacanth, etc., either alone or with starches and gums. In such styles levelness is not a prime essential and may be sacrificed to some extent to penetration.

COLLOIDAL PROPERTIES OF VEGETABLE MUCILAGES

One of the virtues of this type of thickening lies in its powers of suspension of solid materials embodied in printing pastes. For example, white discharge printing pigments, such as thickening lies in its powers of suspension and may be safely used in screen printing and hand block printing without danger of filling in either the screen mesh or the interstices of the hand block.

In block printing one other example may be given. Where faulty thickenings have been used in the first instance as in certain classes of British gum thickening, where an insoluble residue is obtained, this residue settles down on the face of the printer's block and fills in the fine portions of the design. Where trouble of this kind is encountered, an addition of tragacanth or locust bean thickening will hold the soluble portion of the pattern in suspension and will induce trouble-free prints.

SOFTNESS

The soft handle of prints from the point of application to the finished article is one of the outstanding features in the application of this type of thickening and may be brought into play to considerable advantage in the printing of large masses of colors on such materials as furnishing cretonnes with the fast type of chrome mordant dyestuffs. Linens, especially, with large masses of print paste applied, are liable to crack when handled in the dry state prior to wet processing and an addition of one of these thickenings will often introduce the pliability and softness necessary to avoid this cracking effect and subsequent possible serious damage to the goods involved.

Vegetable mucilages, generally, are useful as thickening agents in textile printing because of their low solid content, good solubility and good thickening powers. They may be applied with most types of dyestuffs if careful consideration is given to the circumstances involved. They induce good penetration of the print paste, good fixation of the dyestuff in steaming and ease the problems of washing off and finishing.

Such thickenings should not be mixed with gum arabic or gum Senegal or too much British gum. As an addition to other thickenings, mixing should be done by adding to the vegetable mucilages while stirring rather than vice versa. Excess alkali should, generally, be avoided except in the special circumstances outlined. The keeping qualities of the thickenings are increased by the addition of preservatives such as phenol and formaldehyde.

SEPTEMBER 4—

AATCC CONVENTION ISSUE

SEPTEMBER 18—

SOUTHERN TEXTILE EXPOSITION ISSUE

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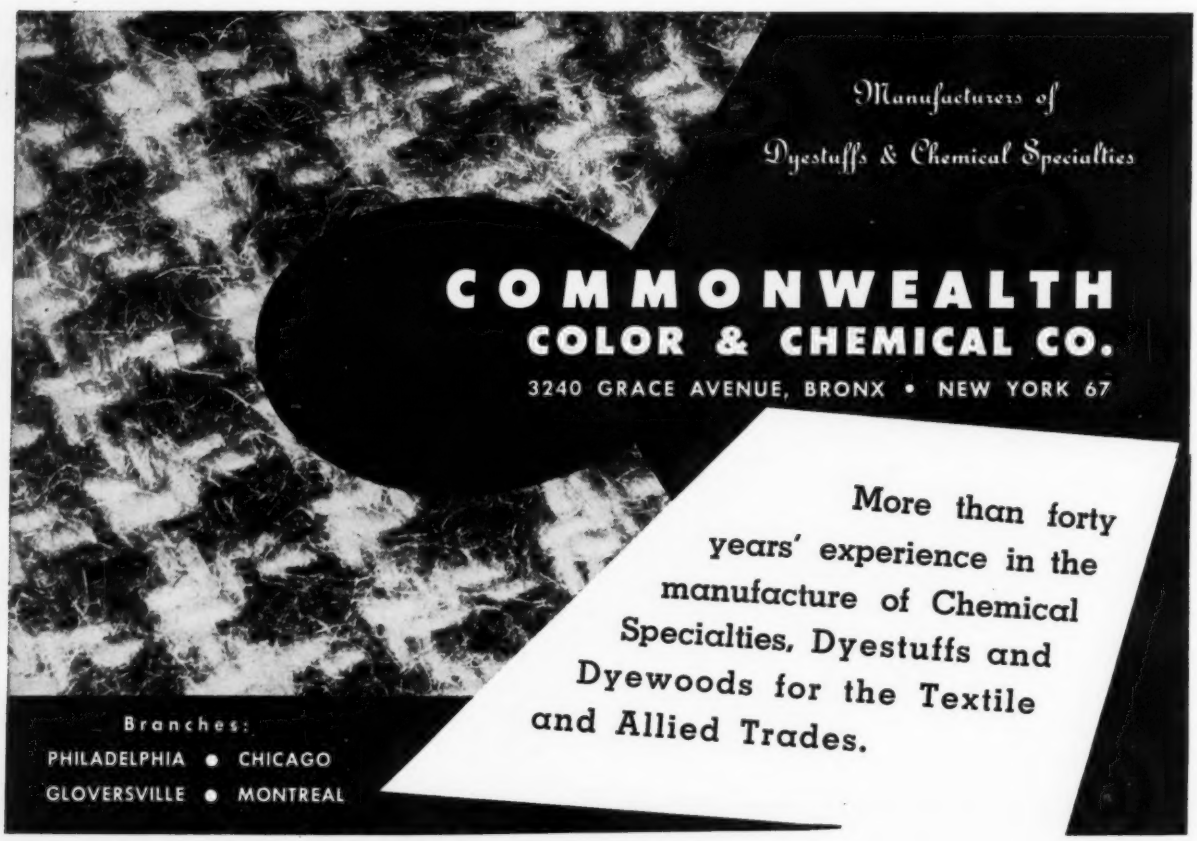
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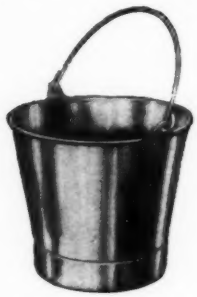

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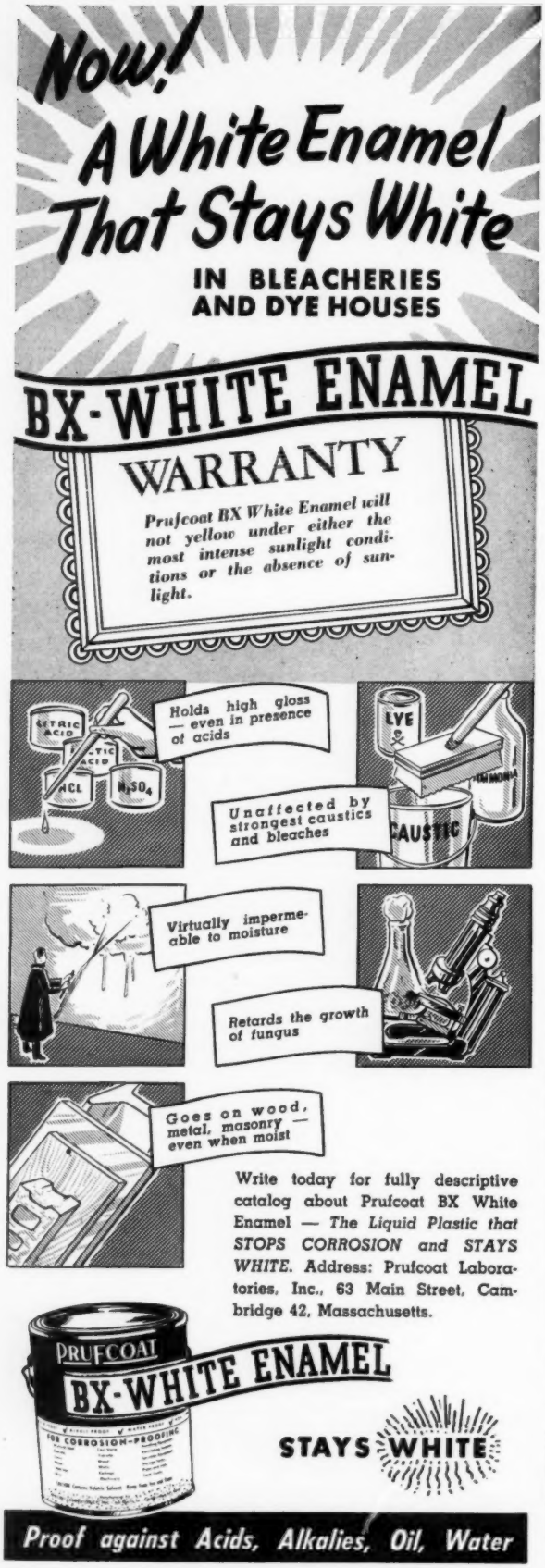
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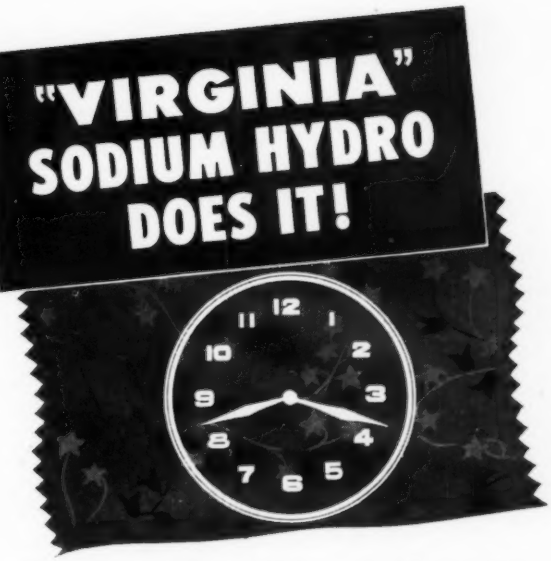

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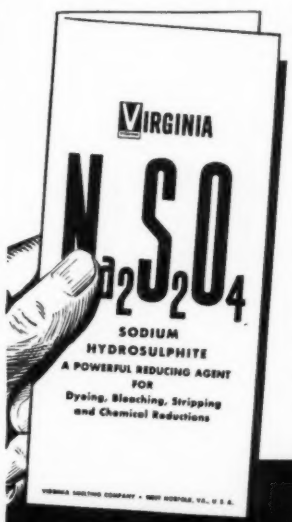

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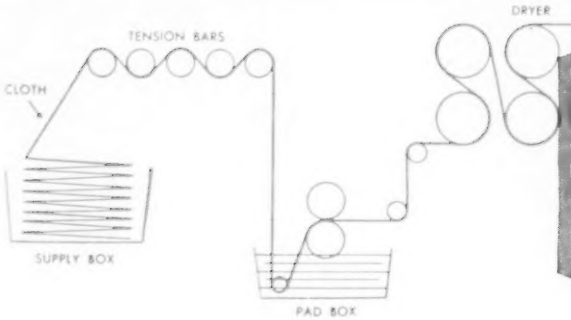

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